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Congress Papers

IN former years it has been customary to reproduce in the main Congress Number the first of the papers and discussions, which were then followed, in subsequent issues, by the remainder. It has been decided this year to alter this procedure and to publish in our issues between now and the end of the year the entire scientific proceedings of the Torquay Congress without the inclusion of any other scientific or research papers. Those members of the Association who do not normally file their journals may find it convenient to keep these December issues which will give them, in compact form, the whole of Congress except for the social events, details of which were published at the time they took place.

This week we are publishing the first two Congress papers; that on " Meat Inspection Abroad " by Mr. Horace Thornton, and " The Present Position with Regard to Bovine Mastitis, and a Review of Recent Trials of Various Antibiotics for Bovine Mastitis " by Mr. C. D. Wilson.

Next week there will be " Myxomatosis," " A Review of Some Technical Aids in Veterinary Radiology," and " The Prevention of Enterotoxaemias in Sheep."

The Torquay Congress was notable for the fact that more papers were read and discussed than at any previous Congress in the Association's history. Additionally, as will become apparent week by week, the number of members of the profession who took part in the discussions seemed, if anything, to be larger than usual. The result will be that THE VETERINARY RECORD during December will be in a position to present a remarkable breadth and variety of veterinary thought, learning and experience.

Those who were not able to attend Congress will thus, we trust, enjoy the intellectual " meat " of it, while those who did will not only recall many interesting hours as they re-read what took place, and they will think, perhaps nostalgically, of a delightful town, a comparatively large amount of sunshine, and the very generous hospitality of the Western Counties Division.

FIRST CONGRESS PAPER

Meat Inspection Abroad

BY

HORACE THORNTON

Newcastle upon Tyne

THIS, the opening Paper of the 1954 Congress, was discussed on the afternoon of September 20th. The Chairman was Professor A. Robertson, M.A., B.SC., PH.D., M.R.C.V.S., F.R.I.C., F.R.S.E., and the recording secretary Mr. G. Tullis, M.R.C.V.S., D.V.S.M.

The Chairman, in opening the meeting, said that they were very lucky to have Mr. Thornton present. Twenty-seven years ago when the Congress was previously held in Torquay there was a paper on meat inspection and the speaker dwelt on two aspects of the subject. The first was the necessity for centralised slaughtering and cutting down the number of private slaughterhouses, and the second was the desirability of having more veterinary control of meat inspection. A quarter of a century later, they had made some progress towards the first of those objectives, but they were still in the middle of a controversy about the second.

The paper on this occasion was based on a much broader aspect of the subject. Mr. Thornton had studied meat inspection, if not from China to Peru, at least from Singapore to Columbia; if travel broadened the mind Mr. Thornton ought to be wearing an outsize in hats by this time! It was a pleasure to ask him to introduce his paper.

Mr. Horace Thornton said that nowadays if one wished to see the world one could adopt either of two methods. One could join Her Majesty's Forces, which was attended with a certain amount of risk, or one could "be sent." It so happened that when his local authority was approached as to their willingness to allow him to make certain visits on behalf of the World Health Organisation and the Food and Agriculture Organisation, they agreed. He thought they had perhaps agreed a little too readily, but apart from that it enabled him to visit some 31 different countries in the world.

The paper gave some very slight idea about the problems of food hygiene in these countries and the impressions one received during the visits. Such impressions had to be very considerably condensed for the purpose of this paper, as his report on India, Ceylon and Burma occupied 95 pages—most of it, he thought, completely valueless!

An attempt was made in the paper to show the difficulties of introducing uniformity into meat inspection throughout the world. One factor was the relative plenitude or scarcity of meat in certain countries as, for example, the Argentine with a meat consumption of 6 lbs. per person per week, compared with India which must have a *per capita* consumption per week of under 2 ozs. And yet in India there was a cattle population of 208 million, though making a conservative estimate, 10 per cent. of these must be quite unserviceable and unproductive.

Touching very briefly on the controversial aspect of methods of slaughter and remembering the fight in Britain prior to 1933 to introduce humane methods, it was not surprising that in many countries of the world the slaughter of animals still left much to be desired. It was quite the accepted thing, perhaps justifiably, to criticise the Jewish method of slaughter at such meetings; but one might sometimes wonder, when one saw the greater number of cattle and sheep killed throughout the world by the Mohammedan method, whether the Moslem faith should escape criticism, even if their methods, like those of the Jews, were actuated by religious observances. One interesting point in connection with Jewish slaughter was raised at a seminar Mr. Thornton attended some months ago in Copenhagen, namely, that the avowed advantage that the animal slaughtered by the Jewish method bled better than those slaughtered by other methods was not founded on scientific experiment. The carcase of the ritual slaughtered animal, it was stated, *appeared* to be better bled because when the throat was cut violent respiratory movements took place and this oxygenated the blood, giving the meat a lighter colour and therefore a better bled appearance.

The controversy regarding the humaneness of electrical stunning would seem to have been settled by the researches of Phyllis Croft, and provided certain conditions were observed he thought they could now regard this as a definitely humane and eminently satisfactory method.

The paper referred to some of the animal diseases encountered in various parts of the world. It had surprised him to find in the United States that the incidence of tuberculosis in pigs had not fallen as one would have expected. The figures for 1953 showed that 2,500,000 carcases of pork were found affected with tuberculosis, 10,000 of these carcases being totally condemned, with a loss in the region of $800,000. The interesting feature was that the infections, now that bovine tuberculosis had been eradicated, were predominantly of avian origin.

Mr. Thornton said that in his paper he had appealed for a more scientific approach to meat inspection. A word of warning should be issued. The excellent codes operating in Germany, Holland and Denmark could not be administered efficiently and satisfactorily except by personnel with a thorough basic knowledge of the subject. If such codes were administered by people who were not in possession of

this basic knowledge they were fraught with very great danger. The scientific approach to food hygiene was seen in its most admirable form in Denmark where meat and milk hygiene were controlled entirely by veterinarians, and after studying many of the codes and procedures throughout the world he felt that those operating in Denmark were a model for many countries, including our own.

The value of bacteriological tests in the judgment of suspected carcases had been stressed in the paper and it would be seen that 80 per cent. of the carcases detained in Danish abattoirs pending the result of a bacteriological examination were found to be sterile and fit for food. He had, therefore, made the astounding but, he felt sure, accurate statement that if we in this country were to adopt a scientific code of judgment in relation to tuberculous carcases, and routine bacteriological aids were invoked in the case of "border-line" carcases that might be affected with a systemic disease, we should save at least half the meat which under the present system was being condemned and destroyed.

THE PAPER

Mr. Thornton's paper, which had been circulated in advance, was as follows:

ANY praiseworthy notions one may have as to the practicability of introducing a system of uniform judgment in meat inspection throughout the world are likely to receive a rude shock after one has undertaken a period of foreign travel. There are several reasons for the diversities of judgment which exist between one country and another. Amongst these are: (a) the economic condition of the country. European countries are, for the most part, financially able to adopt an adequate system of veterinary inspection and to take steps to erect up-to-date abattoirs or modernise their existing slaughterhouses and markets. In the Middle and Far East, however, although there is a general awareness on the part of the authorities concerned of the necessity for adequate public health safeguards, there are other problems considered more pressing with the result that meat hygiene, in its widest sense, has hitherto left much to be desired. (b) The wide differences in the basic knowledge and scientific acumen possessed by the personnel concerned with inspection. (c) The fact that a diseased organ or tissue may be aesthetically repugnant to a consumer in one country, yet may excite little or no reaction on the part of the people in another.

It would, of course, be impossible to deal with the various aspects of meat inspection in each of the 31 countries visited by the writer during the years 1951 to 1953, and it is therefore intended to consider the subject under certain well recognised headings and to indicate some of the practices adopted in different parts of the world. A proportion of these are admirable and worthy of emulation; some are regrettable but dictated by age-old customs and religious observances; many are deplorable and should be discontinued at the earliest possible moment.

The Animals Slaughtered for Human Food

One's conception of what constitutes a good beef animal receives a rude shock as soon as one leaves the shores of England. Even on the Continent the greater attention paid to the marketing of calves as veal, together with the economic importance of milk and its products, has the effect of filling the slaughterhouses with cows or with young animals of an undoubted dairy conformation. In the Far East, also, there is little or no fattening of cattle purely for beef purposes, and in India, where the opposition to cattle slaughter by the Hindus is still as strong as ever, the bovine serves a triple purpose; firstly as a draught animal, secondly as a supplier of milk, and eventually as a source of food for those religious sects who have no ritual objection to its consumption. An exception must be made to the statement regarding the poorness of most of the native cattle in India, for the buffalo makes an excellent carcase, well endowed with flesh and with attractive white fat. In the northern countries of South America cattle are rarely castrated, and it is the custom in dressing the carcase to leave the testicles attached to the hindquarter. These organs are much in demand by the population, who regard them as an aphrodisiac.

Sheep in the Middle and Far East are not nearly as common as one would suppose, but their place is taken by the ubiquitous goat which is very largely responsible for the erosion of soil due to its habit of consuming all vegetation, including the useful soil-binding shrubs. The problem has become so serious in Israel and in Venezuela that energetic steps are being taken to banish the goat from these lands.

Ante-Mortem Care

In many foreign countries animals have to travel long distances to the slaughterhouse and their loss in weight is considerable. In Britain the distances travelled are small and the loss in live weight is of relatively little significance, being accounted for almost entirely by excretion of faeces, urine and excessive water in the form of sweating. When animals travel greater distance, however, there is an actual loss in carcase weight, though the nature of this loss in weight of tissues in a carcase is not yet clear. It would appear to consist of wastage of substance in both fat and muscular tissue with an additional loss of water from the remaining muscular tissue. Investigations have shown, however, that the feeding of pigs more intensively a few days prior to a journey is useless and will neither increase the market weight nor decrease the "shrinkage". In some South American countries the native Criollo cattle are in transit for a week or more, and these animals, which weigh about 450 lb., when alive, lose 20 to 40 lb. in actual carcase weight during the journey. In northern Norway the reindeer herds are slaughtered in the autumn, which is also the rutting season, and the loss in weight of the bucks (though in this case in no way related to transport) is as much as 5 lb. per day.

Quite apart from the necessity of adequate arrangements for transport, is the need for satisfactory facilities for loading and unloading. When visiting the Chicago stockyards it was interesting to observe that the old type of ramp, which consisted of an inclined plane with cross slats of wood, was

being replaced by a system of steps, and one was informed that this innovation has already lowered appreciably the losses due to damage and fractures in livestock during unloading. In northern Italy one encountered an ingenious unloading device for pigs, the lorry being driven on to a metal platform at the factory, the platform then being lowered mechanically until the floor of the lorry was level with the ground. Another device for the unloading of pigs was in operation at an abattoir in Switzerland, the pigs being directed from lorry level to ground level by way of a smooth, slightly concave concrete ramp down which the animals slid and appeared to enjoy the experience.

The feeding of animals awaiting slaughter is only desirable if they are to be detained in a lairage for some time, and Schönberg points out that the justification for withholding food from animals during the eight-hour period immediately before slaughter is directed towards preventing the penetration of bacteria from the intestines into the blood and flesh via the lymphatic system. Feeding is most important in the case of pigs, which lose their muscle glycogen rapidly during starvation or exercise, but ruminants keep a substantial fodder reserve in their rumen and may be starved for up to 24 hours without the supply of glycogen to their muscles being depleted. It is difficult to postulate a period of fasting which, if exceeded, would come within the terms of causing unnecessary suffering, but during the period of control in Britain the writer on occasions witnessed batches of slaughtered cattle affected with so-called "hunger liver", the organ having a pronounced yellow colour indicative of an unnecessarily prolonged period of fasting, with a resultant depletion of the glycogen in the liver and its replacement by fat. Engdah observes that fractures, contusions, and rough transport in which there is considerable physical pain may also cause changes in the colour of the liver of slaughtered animals to a brownish-yellow or yellow.

In the Middle and Far East one's preconceived ideas of cruelty have to be somewhat modified. It is common to witness gross mutilation of the skin of cattle due to branding, and it is also the rule rather than the exception to see live poultry transported and marketed while their legs are tied.

It was gratifying to observe that an *ante-mortem* inspection of animals awaiting slaughter was made by veterinarians in practically every country visited. In some cases this inspection was sufficient to withdraw the animal from slaughter, as in the United States where all animals showing symptoms of rabies, tetanus, milk fever or transit fever are condemned on *ante-mortem* inspection alone and consigned to the by-products plant. In Holland, however, and in most other countries, animals are not condemned purely on *ante-mortem* inspection. The most interesting examination observed on a live animal was in Nicaragua where the incidence of *Cysticercus cellulosae* in pigs is high and where it is the practice for the prospective purchaser of a pig to have the animal's jaws prised open and the tongue palpated for the presence of any cysts situated in the lingual submucosa.

Methods of Slaughter

The western countries have nearly all introduced legislation prescribing that animals must first be rendered unconscious before they are bled; but in the Middle and Far East the methods by which animals are slaughtered leaves much to be desired. Even in Italy and some South American countries one still sees cattle and calves despatched by the neck-stab method, a short double-edged knife known as a *puntilla* being plunged into the occipito-atlantal space thus severing the spinal cord. In northern Norway reindeer are killed somewhat similarly by a single-edged curved knife which is passed into the occipito-atlantal space and directed forward to destroy the brain.

In India practically all animals are slaughtered without being previously rendered unconscious. Most sheep and goats are killed by the Halal or Mohammedan method in which the throat is cut similarly to that in Jewish slaughter; but another method which is practised is the Jatka or Sikh method in which the sheep or goat is decapitated by one stroke of a sword. In parts of northern India skilled operators can decapitate buffaloes by a similar stroke of a special sword.

Except in Britain and the Continental countries, it is a world-wide practice to slaughter pigs without previously rendering them unconscious. Even in the United States, and in that great slaughtering centre, Chicago (where 15,000 pigs are killed daily) practically all pigs are killed without preliminary stunning. The avowed objection in that country to the use of the captive-bolt pistol for stunning pigs is that the animals do not bleed well, while the objection to the use of the electrical method of stunning is that it causes haemorrhages in the lungs which make it impossible to distinguish such lesions from those caused by hog cholera. One cannot but feel that the real objection to the stunning of pigs has an economic basis, on the grounds that if it were adopted it might interfere with the rapid throughput of animals, though, as Anthony observes, it is the lack of violent reflex movements in the electrically stunned animal that makes possible a speeding up in the rate of killing per hour.

Some reference may be made to the electrical method of stunning and a modification of it developed by Tervoert in Holland following research carried out by Barnhoorn and de Smet on electroshock therapy in human beings. These workers have shown that the effectiveness or otherwise of electrical anaesthesia depends on the quantity of electrical energy administered, expressed in watt-seconds (watt-seconds = voltage × amperage × time), and an apparatus known as the Elther has therefore been devised by which a large quantity of electrical energy can be administered over a very short period. Tervoert states that an application of 285 watt-seconds for one second is ample to anaesthetise cattle, while an application of 198 watt-seconds for one second is efficient for the stunning of calves, sheep and pigs. Those who have had the opportunity of witnessing this apparatus in use in the Rotterdam abattoir are of the opinion that the method would

merit an extended trial in this and in other countries.

Another recently developed technique for the anaesthetisation of pigs is now in operation in one abattoir in the United States and consists of driving these animals through a tunnel where they inhale carbon dioxide gas for 45 to 50 seconds. After they emerge they are completely unconscious for 10 to 20 seconds, during which time they are bled, and it is claimed that the blood yield of pigs slaughtered by this method is three-quarters per cent. better than in those which are bled without previous stunning.

The merits and demerits of Jewish slaughter do not come within the ambit of this paper, but it should be stated that animals slaughtered for Jewish consumption in Sweden, Denmark, Norway and Switzerland must be rendered unconscious by mechanical means before the ritual throat cut may be made. In Stockholm a modified type of Elther apparatus is used to anaesthetise cattle prior to ritual slaughter.

Methods of Dressing

Even when carcases are skinned and dressed while suspended, as they all should be, there is a certain amount of bacterial contamination. Scarafoni, quoting Italian authorities, states that 33 per cent. of this contamination is derived from the skin and from dirt on the surface of the animal. and no less than 50 per cent. is contracted during the transport and storage of the carcase. One could not, therefore, fail to be impressed by the procedure in some North American packing houses where sides of freshly slaughtered cattle were subjected to a high pressure water spray (no wiping cloths are permitted), after which the two sides were shrouded in cloths soaked in 10 per cent. saline solution. At the other extreme is the practice in some South American countries of completing the skinning and dressing of cattle, calves and sheep on the slaughterhouse floor, and it was quite common to see bovine carcases being dismembered with an axe while in this position, the meat being removed from the carcase in long strips and taken immediately to the market in baskets. A praiseworthy practice in some abattoirs in Holland and the Scandinavian countries is the employment of mechanical devices by which the blood of slaughtered animals, if intended for human consumption, is collected hygienically and defibrinated by mechanical means in containers of stainless steel.

Post-mortem Inspection

The efficiency or otherwise of this procedure is in part related to the knowledge and experience of the officer concerned, and in practically all the countries visited not only the *ante-mortem* examination, but also the *post-mortem* inspection, was conducted by veterinarians. But no matter how knowledgeable the inspector the efficiency of inspection must inevitably bear some relation to the method of slaughtering and dressing the animal. For example, where the factory line procedure operates, as in the United States, Canada and in the bacon factories of Denmark, it is essential that the inspectorial staff be present during the whole operation, otherwise it is difficult subsequently to associate a carcase with its own particular organs. In Holland it is the practice in dressing cow carcases to leave the udder, uterus and liver on the carcase, and also to leave the lungs attached until the *post-mortem* examination has been conducted. Some control over the rate of throughput is also essential. In the United States there are regulations which prescribe that where slaughtering is on factory-line principles the throughput of animals shall not be greater than 600 per hour, whereas if the factory-line method is not pursued the throughput shall not exceed 60 animals per hour. A device which facilitates the task of the inspector who has to examine the submaxillary lymph nodes of pigs was seen in Danish bacon factories and particularly appealed to the writer. This consisted of a metal cradle which was placed behind the carcase and tilted to a level at which the head and throat region could readily be examined.

Diseases encountered during post-mortem inspection

Except in parts of Europe, the incidence of tuberculosis in cattle and pigs in the countries visited appeared to be lower than in Britain, though it must be recorded that in many countries a similarly wasteful and empirical code of judgment in relation to tuberculous carcases is still pursued. Even in those countries from which bovine tuberculosis has been eradicated, *e.g.*, the United States and Denmark, a number of cases of tuberculosis still occur in pigs and are caused by the avian bacillus. It should, however, be stressed that all tuberculosis-like lesions in the submaxillary nodes of pigs are not due to the tubercle bacillus, and in Denmark it has been shown that approximately only one-third of such cases are due to this organism and two-thirds of the cases to *Corynebacterium equi*. It is therefore the practice in that country to submit nodes showing suspicious lesions to a microscopical examination, and if the infection is shown to be due to *C. equi* the head is released for food. In Holland when tuberculosis of the submaxillary node is found the head of the pig is boned out, the bones sent for sterilisation and the meat passed for food. Similarly, in Holland and also in France certain cases when tuberculosis of bone is encountered, but in which the disease shows definite evidence of chronicity, the whole carcase is boned out, the bones destroyed and the meat passed for food.

The correct attitude which should be adopted in the judgment of tuberculous carcases has been admirably summarised by van Oijen who states that the criterion in the judgment of such carcases should not be to seize the maximum possible amount of meat, but rather to permit the supply for consumption of the largest quantity consistent with a rational application of the law. The relatively greater severity of judgment extended in Britain towards tuberculous carcases as compared with that adopted by the more enlightened Continental countries raises a problem which should receive urgent consideration. In a spirit of critical self-analysis let it be said at once that the common practice of condemning the muscular area of a carcase in cases where the lymph node

of the area is found tuberculous, a procedure which the writer has himself recommended, is scientifically unsound.

Salmonellosis of animals appears to have a world-wide distribution, and it is perhaps surprising that in the underdeveloped countries not more cases of human illness are reported due to the consumption of the flesh of animals which have undergone emergency slaughter. German authorities with whom the writer has had the opportunity of discussing such matters draw attention to the fact that in animals slaughtered while affected with acute salmonellosis not only is the spleen swollen (though less deeply coloured than in anthrax) and the liver swollen with rounded edges, but in the later stages small necrobiotic foci of pin-head size may occur in the liver; in chronic cases of salmonellosis a valuable diagnostic lesion is a thickening of the wall of the gall bladder.

The various non-specific conditions which affect the tissues and organs are encountered in all countries, but reference to one or two may prove of interest. It was surprising to find that in Central America, notably Costa Rica, Panama and San Salvador, the incidence of telangiectasis in cow livers was as high as 30 per cent. There is some evidence that a feeding factor may be concerned in the high incidence of this affection, for Robinson and others in California have noted that there appears to be an increase in telangiectasis shortly after fattening cattle are placed on full feed in fattening pens.

An interesting, though nevertheless fraudulent, practice encountered in Burma was the "watering" of pork. This is carried out by opening the thorax as soon as the pig is bled and introducing a hollow bamboo cane into the heart. A canvas bag filled with water is attached to the tube and water is pumped into the animal's tissues by way of the arterial blood stream. It is also known for the water content of duck carcases to be fraudulently increased by injecting water into the subcutaneous tissue beneath the wings.

Parasitic diseases of animals play a more important rôle in the underdeveloped countries than do affections of a bacterial or viral nature. In South America kidney worm disease, caused by *Stephanurus dentatus*, is very common, and in Venèzuela almost 100 per cent. of pigs reared on the inland plains are affected. In Costa Rica 80 per cent. of the pigs' livers condemned were destroyed on account of this affection, as were also a high proportion of the kidneys.

The incidence of beef measles (*Cysticercus bovis*) appears to be increasing in Europe, and a disturbing feature in Denmark has been the high percentage of calves found affected, even when these animals have been exclusively milk fed. In that country a 17 per cent. increase of cases in calves has been shown to have occurred between 1942 and 1950, and it may well be that in other countries a routine examination for this parasite would be advisable in the case of calves less than six months old.

Pork measles (*Cysticercus cellulosae*) is now extremely rare in the United States, Britain, Germany and Scandinavia, and reports from other European countries also show a marked decrease in the incidence of this parasitic infection. In the South American countries, however, it is a serious and ever present problem, the incidence in native pigs in Peru being estimated at 15 to 20 per cent., in Venezuela 5 to 6 per cent. and in Mexico 8 to 18 per cent. In the latter country a practice was observed in the case of pork carcases affected with a moderate infestation of cysts, the flesh being cut into strips, the cysticerci removed with a stiff brush and the meat fried: this preparation is known as *carnitas* and is considered a delicacy. The habit of indiscriminate defaecation on the part of the population is responsible for the high incidence of pork measles in the aforementioned countries, and also for the fact that *Cysticercus cellulosae* is not uncommon in the flesh of dogs; 10 per cent. of the street dogs in Mexico City were found affected and 7 out of 500 dog carcases examined in Madras.

Hydatid disease is a very common affection in the Middle and Far East and in South America, the contact of dogs with sheep or goats being a prime factor in the perpetuation of the life cycle and in the epidemiology of the human disease. In Greece attempts are being made to interrupt the life cycle of the parasite by providing slaughterhouses with incinerators in which affected organs may be destroyed, while in certain South American countries the problem is being attacked from another angle, by regular vermifuge treatment of the dog population. In India hydatid cysts appeared to be just as common in the liver and lungs of goats as in sheep, a point of considerable epidemiological importance, for Boko in Yugoslavia has shown that the fertility of hydatid cysts in goats is more than five times greater, and in sheep seven times greater, than in cattle.

The incidence of trichinosis in any country can naturally only be assessed with any degree of accuracy if that country subjects its slaughtered pigs to a routine trichinosis examination. One was informed that in Sweden some 50 cases of trichinosis are detected yearly as a result of such examinations, though the incidence of the affection in that country is put no higher than 1 in 3,000, and no higher than 1 in 5,500 in Spain. In Denmark no case has been detected during trichinosis examinations over the last 25 years, though in Norway 2.5 per cent. of the fur-bearing animals are affected. In Greenland a recent survey showed that 70 per cent. of sledge dogs harboured the parasite and six out of 19 polar bears.

In the United States there is no compulsory examination of pork carcases for trichinella in spite of the fact that the incidence of the infection is probably higher there than in any other country in the world. Indeed, Gould and others state that about 1.5 per cent. of all pigs slaughtered in the United States are infected with larvae of *Trichinella spiralis*, and they believe that about 25 per cent. of all Americans during their lifetime harbour the parasite in their muscular tissue.

Bacteriological Aids in Meat Inspection

The view is now generally accepted that all tissues and cavities of the animal body that do not communicate directly with the exterior are sterile, and

that no bacteria are present in the blood, bone marrow, lymph nodes, muscular tissue and abdominal organs, provided the animal is healthy and in a physiologically normal condition. The demonstration, therefore, of bacteria in the organs and muscular tissue of freshly slaughtered animals must be regarded as a suspicious finding which may have a profound effect in influencing the judgment as to the fitness of the particular carcase for human food.

One of the difficulties inherent in bacteriological aids in the judgment of carcases is the correct interpretation of the bacteriological findings, but such reports furnish valuable information as to whether a bacterial infection is localised or widespread, and whether it is of a non-specific type or due to specific pathogenic organisms. The bacteria which may be found in carcases subjected to a bacteriological examination have been enumerated by Jepsen and fall into two groups. They may be non-specific and non-pathogenic, resembling the natural intestinal flora and including such organisms as streptococci of the viridans group, enterococci, *B. coli* in adult animals, clostridia, bacilli of the subtilis-mesentericus group, and non-haemolytic staphylococci. (It must be remembered that certain low grade infections with non-specific bacteria may have emanated from the sticking wound.) On the other hand, the bacteria found may be specific and pathogenic, amongst these being the haemolytic streptococci, *Streptococcus pneumoniae*, haemolytic staphylococci, pasteurella, salmonella, *Bact. coli* in newly born animals, *B. anthracis*, erysipelothrix, listerella and *Corynebacterium pyogenes*.

The results of bacteriological examinations conducted in Danish laboratories on suspected carcases between March 1951 and March 1952 are illuminating for they show that approximately 80 per cent. of the carcases examined bacteriologically were sterile, 10 per cent. were found to have a low grade non-specific infection, 4 per cent. had a high grade non-specific infection, while only 6 per cent. were specifically infected with pathogenic bacteria. Very obviously the finding of specific pathogenic bacteria is an indication for total condemnation of the carcase, and carcases with high grade non-specific infections are also regarded as inadmissible for human food. Low grade non-specific infections, however, justify a favourable judgment with the result that 90 per cent. of the aforementioned carcases detained and subjected to a bacteriological examination were shown to be fit for human food and released unconditionally for sale on the market. As there is no reason to think that the diseases and affections encountered in meat inspection in Britain differ in any marked degree from those which are encountered on the Continent, one would make the suggestion that if a scientific judgment were brought to the assessment of carcases in Britain, particularly those affected with tuberculosis, and bacteriological aids were invoked as a routine measure in the judgment of border-line cases suspected to be harbouring other pathogenic bacteria, at least half the carcases which under the present system are condemned outright could safely and justifiably be passed for human food.

SUMMARY

This paper describes some of the experiences and impressions acquired during a survey on meat inspection made on behalf of the World Health Organisation and the Food and Agricultural Organisation of the United Nations. Reference is made to some of the animals encountered, and to their treatment during transit and while awaiting slaughter. Methods of slaughter and dressing of carcases in the various countries are described and attention drawn to a modification of the electrical method of producing unconsciousness. Some aspects of *post-mortem* examination are dealt with and the diseases of a bacterial and parasitic nature met with in various countries during such examinations. A plea is made for a more scientific approach to the problem of judging carcases as to their fitness for food, particularly in relation to carcases affected with tuberculosis and those suspected to be affected with a systemic disease. Attention is drawn to the fact that in practically every country visited the *ante-mortem* inspection and the subsequent *post-mortem* examination is the responsibility of the veterinary surgeon.

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THE OPENERS' SPEECHES

Mr. C. V. Dayus (Agricultural Liaison Officer to the High Commissioner for New Zealand), in opening the discussion, said:

I consider it a privilege to be invited to join with my distinguished colleagues from Canada, Australia and the United States in opening the discussion at this Congress on a paper by a member of our profession whose practical work, experience, and literary achievements have placed him in the front rank of veterinary surgeons in this country who have applied themselves to the problem of meat hygiene and meat inspection.

I should like to congratulate Mr. Thornton for his excellent contribution on meat inspection abroad which in-

corporates much factual information and is frequently augmented with his own observations. The exacting nature of a wide survey of this kind may be gathered from the fact, which is recorded in the introduction, that during 1951/53 no less than 31 countries were visited. As you may imagine, my task is not easy, as one can agree with much that the paper contains.

A section is devoted to methods of slaughter. In this connection there are, I believe, two fundamental objectives. First, to kill the animal as quickly as possible in such a way as to avoid unnecessary suffering; and, second, in such a way as will ensure that the carcase will have what is known as a good keeping quality. If satisfaction is achieved in *both* these respects, the actual method is of little importance.

Mr. Thornton states: "Except in Britain and Continental countries it is a world-wide practice to slaughter pigs without previously rendering them unconscious." I am not quite sure to what extent this statement is correct, but it does not apply to New Zealand where the stunning of pigs either electrically or by means of a mechanically operated instrument of the captive bolt type is compulsory in both meat export slaughterhouses and abattoirs.

Where it is the practice to slaughter pigs without previous stunning Mr. Thornton suggests the objection to stunning is based on interference with throughput and, to a degree, this is doubtless true. It must be remembered, however, that there exists a genuine bias against stunning because of "splashing" which can occur elsewhere than in the lungs, which is mentioned for a specific reason as being an objection to electrical stunning.

I was interested in the modification of the electrical stunning method, a development in Holland described by Mr. Thornton, although I have no personal experience of it. I cannot, however, visualise the extension of the electrical method to cattle or sheep in New Zealand. We have to deal in part with "run" cattle which would not be amenable to the preliminary application of specialised gear. We satisfy ourselves regarding the two fundamental objectives in slaughtering which I have just mentioned, but as we have no redundant labour we cannot afford the luxury of slowing up operations unduly as is often the case in this country. It is not only for economic reasons that throughput is studied in New Zealand. In an industry which with us is largely seasonal, a time factor is also imposed. In New Zealand it is compulsory to stun cattle by means of a mechanically operated instrument of the captive bolt type.

Before I leave the subject I would like to submit a question to Mr. Thornton.

In connection with the electrical method, the terms "stunning" "unconscious" and "anaesthesia" appear in the paper. Does Mr. Thornton consider in the case of the use of the method to pigs, with the voltage and time of application, that any such state really occurs?

I frankly agree, however, that the apparatus employed is one of the most delightful ever introduced in a slaughtering establishment, as it eliminates the hideous noise formerly associated with the slaughtering of pigs.

With reference to *ante-* and *post-mortem* inspection Mr. Thornton states: "In practically all the countries visited not only *ante-mortem* examination but also *post-mortem* inspection was conducted by veterinarians." If the work involved at both these stages is adequately performed surely an uneconomic number of veterinarians are employed? It is quite a different matter to have veterinarians responsible for some of the work, the whole under veterinary control and supervision, but at the same time utilising the services of a proportionate number of efficiently trained lay inspectors.

Meat Inspection in New Zealand

My position as an opener of the discussion will be due to the fact that I represent New Zealand which has, as you know, a substantial meat industry which is highly important in the economic structure of the country. The total production is not far short of 600,000 tons of meat per annum, and we have become the largest meat exporting country in the world.

As an exporting country we are naturally zealous in maintaining an efficient standard of meat inspection. It is considered, and I venture to suggest New Zealand is not alone in this opinion, that a very good system is in operation. One reason for this is that the system is the sole responsibility of the central Government, therefore, ensuring uniformity throughout the Dominion. Secondly, administration and supervision are carried out by the veterinary staff, a provision following the practice adopted by all countries that have dealt seriously with meat inspection.

One of the activities of the Animal Industry Division of the Department of Agriculture is to administer the Meat Act, 1939, and regulations therewith, and consequently all meat inspection in New Zealand, whether in connection with meat intended for export or for local consumption, is carried out by officers of the Division. For administration purposes there are four districts and the staff in each district is under the control of a livestock superintendent, who is a veterinarian. In turn this officer is responsible to the Director of the Division (also a veterinarian) for meat inspection duties at meat export slaughterhouses and abattoirs in his district.

Veterinary officers are situated at meat works and are in charge of all inspection operations. In some instances the veterinary officer supervises a group of meat works in a localised area. The veterinary officer controls the lay meat inspection staff and is responsible for the certification of all meat and meat products. The staff of lay meat inspectors is round about 300 officers. At each meat export slaughterhouse a supervisory meat inspector, who is responsible to the veterinary officer in charge, is in immediate control of the meat inspection staff.

Meat inspectors are selected for appointment from applicants who have had experience in meat works and livestock experience generally, coupled with a satisfactory standard of education.

An assistant meat inspector is required to serve two years before he is allowed to sit for the examination for certificate of competency. During this period he is required to undergo intensive training in all branches of meat inspection, receiving tuition from the supervisory veterinary officer, classes of instruction being held periodically to prepare the trainee for his examination. If successful in the examination he receives an appointment to the permanent staff. The syllabus of the examination of meat inspection is fixed by regulations under the Meat Act.

An important function of the meat inspection staff at meat export works and abattoirs is to assist the field officers of the Animal Industry Division in the prevention and control of diseases of stock, both by notifying disease incidence in lines of stock killed so that owners can be informed and control measures discussed with them, and by obtaining specimens when required for laboratory examination.

The disease position

With regard to diseases encountered during *post-mortem* inspection, New Zealand is in a fortunate position as compared with some countries. The Dominion is remarkably free from many serious diseases of stock. The insular nature of the country, and geographical isolation, have lent themselves admirably to the control of the importation of all animals under veterinary supervision from recognised disease-free countries. Such diseases as foot-and-mouth, swine fever, pleuro-pneumonia, rinderpest, rabies, and glanders do not exist. The warble fly has never become established. Conditions referred to by Mr. Thornton such as beef measles *(Cysticercus bovis)*, pork measles *(Cysticercus cellulosae)* and trichinosis do not occur in New Zealand.

We have the same problem in regard to lesions in the submaxillary nodes of pigs which are not tuberculous, leading to condemnation of heads. Because of the necessity for rapid differential diagnosis and economic factors in connection with boning, no other approach would be practical.

I agree meat inspection does not only imply the recognition of diseased lesions. The all-important factor is judgment, and that is where the knowledge, experience and ability of a trained meat inspection staff under vet-

erinary administration and supervision comes in. To assist towards uniformity in judgment it is essential to adopt certain rational criteria which may be implemented by a more scientific approach, but for practical reasons the latter must not be too time-consuming or tend to make interpretations more difficult. Mr. Thornton has propounded the difficulties of attempting to introduce a world-wide system of uniform judgment in meat inspection. These, to my mind, are insurmountable. There must be considerable differences, for example, in countries where concentrated populations are on top of a meat industry almost solely established on a production/consumption basis, as compared with those countries also having a large export trade in meat which they are concerned to safeguard in every way.

In conclusion may I express my thanks to Mr. Thornton for his knowledgeable and interesting paper, and say how much I look forward to the discussion?

Mr. L. N. Thornton (Commonwealth of Australia Veterinary Officer), after thanking the B.V.A. for inviting him to the Congress, said that he was happy to contribute to this discussion and hoped his few remarks would add something to their knowledge of meat inspection in other parts of the world. The author was to be congratulated upon presenting a paper which set out in a very clear and concise way the observations that had been made.

Australia, a Commonwealth of six States, was a country in which each State was very jealous of its sovereign rights. When the Federation was formed the Commonwealth Government took over the control of many things, but in agriculture and primary produce it was not given any control at all. Control in that sphere was kept by the States and, consequently, meat inspection for local consumption there was governed by several different bodies.

Regarding the Federal body which controlled meat for export, it had the work directly under the Chief Veterinary Officer, who was responsible to the Secretary of the Department. The Chief Veterinary Officer had under him a staff of veterinarians and lay inspectors. At the moment there were about 22 veterinarians on the staff distributed over the whole Commonwealth, but that was not sufficient for requirements. The lay inspectors numbered about 400. They were similar to the sanitary inspectors in this country. They were mostly men who had been in the meat business, but they had attended a technical college and were not so employed unless they had a certificate for meat inspection. The Department controlled the whole inspection of meat for export, right through the stages of *ante-mortem*, *post-mortem*, freezing and handling, until the time the meat was placed in the ship. It had no control over local inspection. If during inspection an animal was found to be not up to standard it was merely rejected for export and handed over to the local authority for final judgment.

Apart from the frozen meat trade, it controlled also the meat canning trade and its hygiene. As a matter of fact, the same staff controlled the inspection of canned fruits, dried fruits and various other commodities for export.

Methods of Inspection

The methods laid down for inspection were based upon the requirements in Great Britain. This country was the largest buyer of Australian meat, and the methods came into being as a result of a request from the United Kingdom that some uniformity in meat inspection standards should be set up in Australia.

The inspection of meat for home consumption in Australia was in the hands of several local and State authorities. At some larger centres Boards were set up to control the slaughter and handling of meat within a certain area. There was one in Brisbane and one in Sydney, and several others in the bigger country centres. Other areas were under local municipal councils or shire councils.

At some of those authorities inspection was under the direct control of the Chief Veterinary Officer in the State, and they all employed a staff of lay inspectors to do the actual inspecting. In no case was the actual inspection done by veterinarians, but in all cases it was supervised by them.

In the larger municipalities the service was a very excellent one run by capable meat inspectors; but in the smaller country towns of perhaps 300 to 600 population the inspection was in the hands of the local police constable, if he happened to be near when the animals were slaughtered.

The multiplicity of inspections led to a great deal of overlapping, duplication and waste of manpower. Efforts were being made to overcome this and discussions were at present going on with a view to streamlining the system.

Mr. Thornton went on to refer to a small country town with about 5,000 inhabitants whose meat was supplied by a private abattoir which killed enough beasts during the week to employ fully one inspector, but at times there were four inspectors present—one from the local municipality because some of the meat went to the town, one from the shire because some of it was distributed to the shire, one from the State capital because some of it went there, and one other because some of the meat was for export. That was a case showing there were anomalies to be ironed out.

The construction of, and hygiene in, some of the bigger abattoirs was felt to be equal to the best in the world. It did not apply to all the abattoirs, but pride was certainly taken in the larger ones.

Methods of Slaughter

Turning to methods of slaughter, cattle and calves were always stunned by means of a hammer. What had been said about electrical stunning was not applicable to cattle in Australia. Some of the cattle were at stations as large as England. They were mustered only two or three times in their lives and were not very amenable to handling. The method of despatch with a hammer was found to be equally good as that entailing electrical stunning. It was rapid and effectual.

Pigs were stunned with a hammer in some cases, and in others were not stunned at all. The method of severing the large arteries of the neck while the animal was alive was still used.

The meat industry in Australia was seasonal and the majority of lambs were killed within three months. Again the hammer method was used, and the slaughterer became very adept. With one sweep of the knife the throat was severed, and the cut was continued and severed the spinal cord. Lambs were killed at the rate of 1,200 an hour. Only two men were employed on it, so they worked fairly rapidly. Cattle were killed at the rate of about 100 an hour. This rapid killing rate required the employment of a large number of staff. On one chain killing sheep at this rate 13 inspectors were employed.

Horse meat was not allowed to be sold in Australia for human consumption. Quite a lot was sold for pet food, but it had to be stained with dye so it could be distinguished. Nevertheless, particularly with the influx of southern Europeans recently, it was probable that horse meat was in fact being used for human consumption. One works was used for the killing of horses for export, some for shipment to this country and the rest for other parts of Europe.

With regard to diseases, Australia, like New Zealand, was very fortunate, having none of the diseases referred to by Mr. Dayus, except a small amount of pork measles and beef measles. The cattle were watched very carefully. There was very little emergency slaughter in Australia for the reason, Mr. Thornton believed, that there was quite a large surplus, and there were not the troubles encountered in this country.

He had recently read in THE VETERINARY RECORD an article by Mr. Norval of Edinburgh which said that during the war a large number of sheep suffering from enterotoxaemia were sent for slaughter. He thought that once an animal showed symptoms of that it did not live long enough to be got to the slaughterhouse, but he might be wrong.

A disease which was encountered in Australia was "Q" fever, caused by rickettsia, and at times there were cases of employees and inspectors suffering from it. It was an acute febrile disease and in one or two instances proved

fatal. It was not really known how the disease was transmitted, but it was felt that the organism was deposited on the coat of the animal by the vector and was inhaled by the operative.

Only one case of tuberculosis in sheep had been reported in Australia, and that state of affairs was a great boon. The main losses were due to hydatid and other parasitic diseases. The hydatids were spread mainly, it was felt, by the dingo and other wild dogs, as well as by careless sheep farmers who threw offal and livers, without sterilising them, to the sheep dogs when ration sheep were killed.

Once more, he wished to congratulate Mr. Horace Thornton on his very excellent paper.

Dr. Orlan Hall (Assistant Veterinary Director General, Canada), then contributed the following observation: Before Federal Inspection is granted to a slaughtering or meat processing plant, the plant is required to be so constructed, remodelled, equipped, and otherwise arranged as to provide the means for the maintenance of proper sanitation and the facilities necessary for carrying on the inspection. Some of the requirements are: ample space for cleanly operations; abundant supply of portable water; predominance of impervious floors; smooth, flat-surfaced impervious walls, means for adequate lighting and ventilation; rust resistant metal equipment for handling meats; hot water under adequate pressure; modern plumbing; proper sewerage; pavement with drainage for livestock pens; and outside premises free from objectionable conditions. In Canada to-day there are 130 such establishments under the control of the Federal Government, to each of which a number has been assigned by the Minister of Agriculture.

A Veterinarian in Charge (with as many assistants as are deemed necessary), who is in constant attendance during plant operations and responsible for the continuous supervision of slaughtering and other operations, including normal temporary periods of cessation, is assigned to each establishment at which slaughtering is conducted. Each veterinarian employed on this work must be a graduate of a veterinary school or college—recognised by the Canadian Veterinary Medical Association—and must undergo a prescribed probationary period of training in meat inspection following graduation before he can be considered for permanent full-time employment by the Department. All animals receive *ante-* and *post-mortem* veterinary inspection under the strict surveillance of veterinarians who are assisted by meat inspection assistants (detention officers) in supervising the cutting, curing, smoking, cooking, refining, canning, marking, labelling, and shipping of the meats and meat food products prepared at the establishment. These meat inspection assistants are technically trained men why by reason of having had previous employment in the meat packing industry often become expert in detecting unsoundness of meat. In certain instances, where the volume of operations warrant, their services are utilised in assisting the veterinarian on *post-mortem* duty to detect diseased or other noxious conditions.

The regulations under the Meat and Canned Foods Act are considered to be comprehensive. They are mandatory as to the disposition of carcases and parts of animals found on *ante-mortem* and *post-mortem* to be affected with certain diseases, parasites, and conditions. Since it is recognised, however, that much must be left to the judgment of the veterinarian as to when a disease is noxious or when a condition is objectionable, under the standards of hygiene, numerous principles and directions have been incorporated for their guidance.

Animals about to be slaughtered undergo veterinary examination for signs of any disease or condition that may cause condemnation of the carcase or any part of it. Any animal found to be badly diseased or otherwise unfit for food purposes is removed from the companion animals and is not allowed to be taken to the slaughtering department, but after marking with special identifying metal ear tags is either killed and destroyed for food purposes, or held in the custody of the inspector until recovery is complete. An animal found with infection or a condition which might cause condemnation of the carcase is segregated from the healthy appearing animals, and after being identified with an ear tag bearing the words " M.I. Held " is slaughtered apart from other animals. This work is an important part of the Canadian meat inspection service, as without it animals stricken with disease dangerous to human health and those sick or showing other obnoxious conditions would be apt to be used for food purposes.

Particular stress is placed on *post-mortem* veterinary inspection. Officers assigned to this work are in close attendance upon all phases of killing, skinning, eviscerating and dressing of each animal to search for signs of disease and other questionable conditions, and to enforce sanitary regulations.

When the number of animals dressed per hour does not exceed certain general limits, one veterinarian performs all phases of the inspection. When the number of inspections per hour exceeds certain general limits, the number of veterinarians is increased accordingly and the work so arranged and co-ordinated that each veterinarian gives his entire attention to some particular part of it. It is a requirement that means be provided to assure the identity of several parts and organs with the carcase during the various stages of *post-mortem* inspection in order that they may be correctly assembled should disease be found in any of them. The veterinarian must in each instance assure himself that all carcases are clean and wholesome in every respect.

The " Inspection Legend "

By means of official tags, seals and locks in accordance with the need, the service maintains accurate identity and control of inspected animals, carcases and products. Each kind of retention tag is prepared in serially numbered form which facilitates ready recording and checking. All devices for applying the marks of inspection directly upon the approved meat are kept under official custody. One stamp or mark is placed on each quarter of the carcase. However, each primal cut may be stamped if the management so desire. This mark of inspection is called the Inspection Legend and consists of the words " Canada Approved " between two concentric circles, in the centre of which is an imprint of the Crown which is a facsimile of the authorised pattern. To the left of the Crown is the abbreviation " Est " and to the right is a space containing a number which identifies each particular establishment.

In brief, the Inspection Legend is described as a Government mark which indicates that the carcase, portion or product thereof so marked was at the time of marking, sound, healthy, and fit for food and that the products were manufactured under sanitary conditions. It must not be used for advertising purposes without the approval of the Veterinary Director General, nor can it be used at any time to mark an inedible product.

Any can, jar, or other receptacle constituting the immediate container of passed product is marked by a trade label, which must be approved by the Veterinary Director General before its use is permitted. Essential requirements of an approved trade label are that it bears the true name of the article contained in the package, the Canada Approved legend with the number of the establishment in which it was produced, the net weight of the contents, or, when applicable, the volume in fluid ounces; the name and address or in the case of a firm or corporation, the firm or corporation name and address of the packer or of the first dealer. Enforcement of the regulations applying to the correct marking and labelling of meat food products makes it possible for persons to ascertain for themselves whether their meats are properly inspected and reliably labelled.

As stated previously, provisions are contained in the regulations whereby the work of this Division includes not only *ante-* and *post-mortem* inspection, but also supervision over the cutting, curing, smoking, cooking, refining, etc. This work, normally performed by the meat inspection assistant, is considered to be of the utmost importance and since spoilage may occur at any stage of preparation the products are inspected, and re-inspected repeatedly, during the entire time they remain at an establishment. Not only are the meat and meat food products guarded as to soundness and cleanliness, but

care is taken to see that ingredients and seasonings such as flour, sugar, salt, spices, are clean and fit for their intended use. Samples of these added products, approved curing agents, and the finished meat and meat food products are collected regularly and referred to Departmental laboratories for chemical and bacteriological or other technical examination. While these are some of the duties normally performed by meat inspection assistants their main task is concerned with strict enforcement of the sanitary requirements as laid down in the regulations.

While the main purpose of a packing house is processing livestock for food, it also concerns itself with the production of by-products and many additional commodities such as chemicals, pharmaceuticals, etc. Each establishment (at which slaughtering is conducted) operating under the control of this Division must be equipped with inedible-rendering facilities suitable to the needs of the plant before inspection can be granted. It is from this section that the plant management derives many of their by-products that are offered for sale to the fertiliser, soapmaking, ammunition, and aircraft industries.

The destruction of condemned material, that accrues during the normal run of operations, is accomplished by reducing it to inedible grease and tankage residue. All condemned carcases, portions or products remain in the custody of the inspector until destroyed at the same establishment where condemned. None of the condemned material is offered for sale in the raw state.

Conclusion

From the foregoing, it will be seen that the work of this Division concerns itself with:—

(a) Good sanitary conditions at inspected establishments.

(b) Veterinary *ante-mortem* and *post-mortem* inspection of cattle, sheep, swine, goats, horses, poultry.

(c) Supervision over the preparation of meat and meat food products to ensure cleanly procedure.

(d) Rejection of harmful dyes, preservatives, chemicals or other deleterious substances.

(e) Custody of condemned material until it is destroyed.

(f) Placing the marks of inspection on inspected and passed meat and meat food products or containers thereof.

(g) Guarding against the use of false or deceptive labels.

Lieut.-Colonel Rollond O. Scott (U.S.A.F. (V.C.)) was the last of the opening speakers. He said: I want to take this opportunity to congratulate the speaker on the excellent paper just presented. It is the only report that I have had the good fortune to review that covers world-wide meat inspection in its broader sense.

Before reading this paper I little realised the problems and conditions existing in countries where the way of life, dictated by a lack of developed resources and other inhibiting causes, does not begin to approach the standards attained in most of the countries of the Western world.

We must all surely agree with the speaker, that economic conditions within an area dictate the standards employed in meat inspection service. Furthermore, I might add that the success of any meat inspection programme depends upon the knowledge of the inspection service, and the extent to which the professional inspector enters into the programme.

I would like to re-examine certain phases of the paper that refer to meat inspection in the United States, but before doing so must comment on the speaker's remarks regarding the method of slaughter in certain countries in South America, in which the testes are left attached to the hindquarters and are in demand because of their supposed aphrodisiac qualities; and our Government dare not consider this procedure, particularly for our troops overseas, for obvious reasons!

With reference to the method of slaughter just presented, I would like to express our views on the stunning and bleeding of animals.

Whilst there is no doubt that the stunning of the animals with the various stunning apparatus, including the spring bolt and the bullet shooting apparatus such as the bolt-pistol, has some advantages, such methods could not be satisfactorily carried out in the large slaughtering centres of the United States, because a large percentage of the food animals are range cattle and have never been accustomed to handling, and therefore stunning by the aforementioned method would not only be impracticable, but an impossibility in most cases.

The preferred method for cattle, termed "knocking," is to stun the animal with a heavy "sledge." Furthermore, the construction of the stunning pens, coupled with the skill of the men employed for "knocking," renders this method perfectly satisfactory, and without unnecessary cruelty, as it seldom occurs that the animal is not completely stunned with a single, well-directed, blow.

At this time I prefer not to go into the merits of our method of slaughter for pigs. It does appear, however, that the method of using carbon dioxide gas chambers would be a solution to our pork slaughter problems in the larger plants.

Relative to bleeding, extreme climatic conditions and long distance over which the product must be transported are two of the factors which dictate the necessity for excellent keeping qualities of meat, and since keeping qualities depend in part on thorough bleeding, it follows that thorough bleeding is assisted by:—

(1) Sufficient rest for the animal before slaughter;

(2) The health of the animal;

(3) The killing or stunning method which favourably influences bleeding when the medulla oblongata remains intact; and

(4) Strong and long-continued respiratory and cardiac action.

In commenting on the paragraph "Disease Encountered during *post-mortem* Inspection," as pertains to tuberculosis and the derivation of standards employed in the handling of infected carcases, I would like to review for you Part II of "The Regulation Governing Meat Inspection of the United States Department of Agriculture" covering the disposal of diseased carcases and parts:—

Firstly, no meat, which is interpreted to mean carcase, part of a carcase or organ, should be used for food if it contains tubercle bacilli, or if there is a reasonable possibility that it may contain tubercle bacilli, or if it is impregnated with toxic substance of tuberculosis or associated septic infections; and secondly, meat should not be destroyed if the lesions are localised and not numerous, if there is no evidence of a metastitic process and if the animal is well nourished and in good condition, since in this case there is no proof, or even reason to suspect, that the flesh is unwholesome.

I believe these standards are approximately the same as those employed by your own meat inspection service.

Trichinella

Relative to trichinella. In the United States, as previously stated, there is no compulsory examination of pork carcases for trichinella. Our experience reveals that laboratory examinations for trichinae have proved time-consuming and somewhat inaccurate. Because of this and other factors our Department of Agriculture regarded it as impracticable to inspect hog carcases for this disease. It has further taken the view that such inspection, which, as formerly carried out for export products, would cost approximately £1,500,000 if all hogs killed at inspected houses were so examined, and would do more harm than good. It would create in the minds of the consumers a feeling of false security, which might lead them to omit the only sure means of escaping danger, namely, to refrain from eating uncooked or uncured pork, and it would thus defeat its very purpose, and negative the great effort and expense involved.

In the United States, safe methods other than microscopic inspection for trichinae have been employed by the Bureau of Animal Industry to prevent trichinosis as a result of eating infected pork. These methods, which provide a treatment sufficient to destroy all live trichinae in pork products consumed are: to heat all parts of the pork tissue to a temperature of not lower than 137° F., or by freezing to prescribed temperatures for various periods depending on the diameter or thickness of the product, or by curing in accordance with certain requirements for specified periods.

In spite of our ideas and concept in the handling of trichinosis in the United States I will have to admit that the incidence of infection among our swine herds is possibly the highest of any country in the world. Also, as reported by our speaker—that approximately one quarter of the American population harbour the parasite sometime during their life. From this you can see that we have taken this infection lightly and if one quarter of our population reveal sub-clinical manifestations then our control practices are not too effective.

The economic conditions of a country play an important part in any programme of meat inspection. When it is shown that it is financially economical for a country or a group of people in a country to adopt a particular type or method of inspection then, and only then, will it be adopted. To emphasise this point I wish to quote from an article that appeared in *Time* magazine on August 30th this year, on trichinosis and vesicular exanthema. The writer of the article said: "Public health workers know that trichinosis could be virtually wiped out if the feeding of uncooked garbage to pigs could be stopped. But using cooked garbage is an expensive proposition, and hog farmers have long refused to comply. Meanwhile, an average of 350 U.S. citizens per year fall ill, and 13 die, from trichinosis.

This year hog farmers finally took action. Reason: vesicular exanthema, a disease of hogs that, unlike trichinosis, is not transmissible to human beings. The University of Michigan's Professor Arthur Moore, reports in the *A.M.A. Journal*, "This virus disease spread in the country at wildfire rate through the feeding of raw garbage. It not only hit the large herds of the garbage feeders but, because of its infectiousness, quarantines were called for, that also stopped the shipping of grain-fed swine out of many areas. That affected the farmers' pocketbook. Without hesitation, the farmers turned on the legislators, and most responded with speed and unity seldom witnessed.

"Laws forbidding the feeding of uncooked garbage to hogs are now on the statute books of 43 States."

The disease vesicular exanthema is not to be confused with foot-and-mouth disease and is not found in your country. If my memory serves me correctly I believe the disease was first diagnosed in California in 1952, and has since taken the country by storm.

Forty-three States have enacted legislation requiring the cooking of garbage and the remaining five States, I believe, are now in the process of enacting legislation. California was one of the last States to enact legislation requiring the cooking of garbage and they put it very bluntly to the farmer and gave him one of three alternatives which are:—

(1) Cook their garbage.
(2) Use some other feed in place of garbage.
(3) Get out of the pig business.

At the present time the disease once more presented itself in the State of Iowa, which along with the State of New Jersey, are the only two States where the disease is now present.

THE GENERAL DISCUSSION

The Chairman said that after the comprehensive contributions already made it might appear that there was very little which could be added to the discussion, but it was a time honoured tradition to allow time for contributions other than those of the official openers. Mr. Thornton was proposing to show a number of slides when making his reply, and members were therefore asked to keep their remarks short. To begin with, Dr. Wooldridge, who had been closely associated with Mr. Horace Thornton's work, might like to say a few words.

Dr. W. R. Wooldridge, PH.D., M.SC., F.R.I.C. (London), said that Mr. Horace Thornton had given them an admirable paper dealing with the various meat inspection services almost throughout the world. The conditions under which those meat inspection services operated were extremely diverse, and yet there was one factor which stood out almost universally, namely that meat inspection was under veterinary control. What could be learnt from that in this country?

We may ask, therefore, why had practically all other countries adopted a meat inspection service which was under veterinary control? The first reason was that they considered that such control was absolutely essential in the interests of the consuming public. This fact might not seem very obvious on a superficial review. One might ask why it could not be done by the medical or another profession. The answer to that was there were three parts to the meat inspection service which must be adequately co-ordinated by a sound scientific knowledge.

The first was the *ante-mortem* inspection: the condition of the animal's health when it entered the slaughterhouse and before it was slaughtered; the second was the pathological examination of the meat as obtained in the slaughterhouse; and the third was the frequent necessity of a laboratory examination in the interests of both human health and economy.

It was generally thought abroad that the veterinarian was the man who could co-ordinate and operate each of those three parts, so essential in safeguarding human health.

Secondly, it would be found throughout the paper that other countries considered veterinary control was desirable in the interests of the producer. This inspection persuaded and encouraged the producer to bring forward good quality animals, especially as the producer learnt that under veterinary control he usually got a far better financial reward for his work.

There was also the desirability of establishing slaughterhouses with proper hygienic management and control. It was essential not only to have adequate buildings, equipment, water supplies and such like, but these material facilities should be operated in the interests of hygienic management and the avoidance of disease. There should be every facility for the personnel at abattoirs to be clean and to be able to keep themselves and their clothes clean. These washing and laundering facilities Mr. Thornton and he had found in various other countries, facilities rarely found in this country. It was a view commonly held that the status of the veterinary profession more readily enabled this requirement to be emphasised and the authorities, whether national or local, encouraged to introduce those facilities.

A third reason for veterinary supervision was expressed in the view which ran through the paper, that the humanitarian aspect of slaughtering should be given fuller consideration. Here again, the profession was in a paramount and unassailable position.

The lesson that must be learnt in this country was that from all aspects it was essential for the veterinary profession to play a much greater part in the meat inspection service than it did to-day. In saying that, one was not in the slightest adversely criticising those gentlemen from various other vocations as well as those from the veterinary profession who had done such good work in meat inspection already in this country, but under limited conditions. Everywhere one went to-day one heard of the necessity for us to have our lives placed upon a sound scientific basis. The veterinary profession was trained in all spheres of animal husbandry. It was trained in all the sciences that went to make up a proper understanding and judgment of the health of an animal and of the quality of its products. It had a status in the country nowadays which enabled it to speak on an equal footing with the medical profession and all other branches of biological science, as well as the lay administrators.

From the angle of those reasons alone it semed that the outstanding lesson that should be obtained from the paper was that the profession had a destiny to play a far greater part in meat inspection than hitherto. It was up to them as a profession to make sure they provided the necessary personnel for carrying out that work.

Mr. E. de Nooy (Holland) said that for some 30 or 40 years the Dutch veterinarians had had to try to convince their Government that efficient meat inspection was a necessity. They had a big ally in that fight, namely, the United Kingdom Government.

The most dangerous carcases often did not show clear symptoms at the *post-mortem* inspection, and therefore in Holland there was a bacteriological examination in all cases of doubt and in all cases in which there was

slaughter of an animal without *ante-mortem* inspection. His teacher had taught him that one could never do bacteriological examination too often for good meat inspection and that was the first duty in connection with national and international health.

Mr. H. E. Bywater (Hon. Treasurer), after paying a tribute to Mr. Horace Thornton, Dr. Wooldridge and the other speakers, said that he was not going to plead the cause of meat inspection by veterinarians because the audience consisted of veterinarians and that would be preaching to the converted. But the point had to be got over to the general public, and he suggested the members could do no better in the interests of public health than to take every opportunity to discuss the matter with their better-informed clients and to get the public at large more " meat inspection minded."

The National Association of Local Government Officers published a magazine called *Public Service*, and the current month's issue contained a leader which had the impertinence to state that the sanitary inspector by virtue of his training was better qualified to undertake meat inspection than the veterinary surgeon. That was the sort of unfortunate propaganda which was put about.

Mr. Bywater said he wanted to have a little leg-pull with Col. Rollond Scott and say that, while he admired very much the Americans and their work on meat inspection, he was a little perplexed at their attitude towards trichina and it was a sad reflection that a disease of animals measure had to be brought into force to bring about a public health necessity. He remembered reading a book called *Meat Hygiene* by Miller, much of which was taken up in explaining why nothing was done by the meat inspection service about trichina infection, except to acquaint the public of the risks involved.

Having what he called another leg-pull, Mr. Bywater referred to the attitude of the Americans towards humane slaughter. He quite agreed that in slaughtering ranch cattle it would be impossible to adopt usual mechanical or electrical methods of stunning, but he crossed swords with their American colleagues in the matter of slaughtering pigs and was sorry they excused themselves for not adopting electrical stunning by saying that it produced haemorrhagic lesions which were indistinguishable from swine fever lesions. That was not in accord with experience in this country and veterinarians in large bacon factories, like Anthony's, were unable—as he was—to explain how that argument could be justified. He paid tribute to the introduction—by an American business house—of carbon dioxide narcosis prior to slaughter, and thought that was a method which could be adopted throughout the United States with great benefit to animal welfare.

They had been told of the expeditious manner in which sheep were despatched in Australia and New Zealand. He had some experience of the cutting of sheep's throats and severing of the spinal cord, as well as of seeing pigs with their throats cut, without preliminary stunning. As a veterinary surgeon, he said such practices were absolutely deplorable. It was no excuse to say the period of suffering was short. Split seconds could—in the mind of the sufferer—be exaggerated into very long periods, and in any case one could not measure suffering in terms of seconds or parts of seconds. If the will was there to do so, methods of slaughtering could be introduced which were humane and at the same time did not upset throughput. It was a matter of arranging things in the right way. He was certain, provided the method was according to that now generally accepted as correct and the apparatus was not faulty, electrical stunning could, and should, be used in the slaughtering of pigs and other animals as well.

Dr. F. I. Awad (Egypt) said that he wanted to congratulate Mr. Horace Thornton on his magnificent paper and to say that he was impressed by the experiment in Denmark relating to the Jewish method of killing and bleeding. In a country like his own the method of slaughtering was strongly connected with a religious foundation; the Mohammedan method ensured good bleeding which was essential for the keeping quality of the meat, especially in hot countries. He thought that it was of vital importance to spread the knowledge of experimental findings—that the humane methods appeared to ensure efficient bleeding of the carcase, so that they would be universally adopted.

He agreed with what Dr. Wooldridge said about the part of veterinarians in meat inspection. In his own country they had veterinarians in charge of abattoirs. There was no doubt that a veterinary surgeon could interpret a disease which a meat inspector could never interpret, and his place in the slaughterhouse was very essential.

Mr. K. N. Vaughan, B.V.SC. (Liverpool), said that the meeting was the most international one he had been to. They had heard from Australia, New Zealand, America, Holland, and Egypt, but nothing had yet been said about the British Navy. He would like Mr. Thornton to say if when their poleaxe friends in Sydney went on strike the British Navy was still brought in.

THE REPLY

Mr. Thornton, in reply, said he was glad the contributors had followed the Marquess of Queensberry's Rules and not deviated too much from the general format of the paper because that enabled him to show some slides by way of reply and deal with the points made by some of the speakers in the course of doing so.

He then showed a series of coloured slides, a number of which were of various breeds of animals in different countries; others demonstrated methods of slaughter and the effects of certain bacterial and parasitic diseases. One slide showed the slaughter of a goat by the Sikh method, carried out by complete decapitation with one blow of a sharp sword. Another showed an abattoir abroad where cattle were being slaughtered in sight of each other. Mr. Thornton commented that there was some doubt whether the witnessing by one animal of the slaughter of another was productive of suffering, but the benefit of doubt should be given to the animal. Many slaughtermen in the Middle and Far East showed great scars on their hands and legs, acquired during the slaughtering of pigs, and to avoid this a large piece of wood was sometimes rammed down the animal's throat prior to the cutting of the throat.

Another slide demonstrated the electrical stunning of cattle in the Rotterdam abattoir by the Elther apparatus. When the current was applied the animal fell immediately to the ground, the legs were rigidly extended, the head bent back and respiration ceased. There was a complete absence of reflexes of the eye, muzzle and tail, these manifestations agreeing with the syndrome described by Phyllis Croft as indicative that a general electroplectic shock had been produced and that the animal was unconscious.

Mr. Thornton said in reply to Mr. Dayus's query regarding the electrical stunning of pigs that one could safely say that the animal would be rendered unconscious if the voltage was not lower than 75, the strength of the current not less than 250 milliampères and the tongs applied for not less than ten seconds.

It had been said by two of the speakers that the slaughter of cattle by mechanical means was impracticable in the case of animals which were not used to being handled. Mr. Thornton accepted that and he did not think they could ever get over the fact that animals of the type referred to could not be slaughtered expeditiously by mechanical means.

The routine inspection of pigs' heads was an onerous task, and Mr. Thornton illustrated a trestle used in Denmark to facilitate this examination. The incidence of tuberculosis in pigs in that country was slightly below 1 per cent. and the infections, as in America, were predominantly avian.

Measles of pork was a common affection in South America; the cysts were occasionally found in dogs, which were scavengers and had ample opportunity for access to human faeces in countries with primitive methods of sewage disposal.

In conclusion, Mr. Thornton said that some of them might become a little discouraged, as indeed they all did as the years passed, by their failure to assume their rightful rôle in the control of meat hygiene, but he wanted to remind them of the words of that very great

man, Winston Churchill, when he spoke to the boys of Harrow on one of their speech days. What he said was "Never give in. Never, never give in, in anything great or small."

THE CHAIRMAN, in proposing a vote of thanks to Mr. Thornton and the contributors to the discussion, said it would be agreed by all that they had had a most stimulating and fascinating afternoon.

The vote was carried with acclamation.

FULBRIGHT TRAVEL GRANTS (1955-1956)

The United States Educational Commission in the United Kingdom announces that, under the provisions of the Fulbright Programme, travel grants are available to citizens of the United Kingdom and Colonies to go to America for an academic or educational purpose, such as study, research, lecturing or the pursuance of other educational activities. All awards are competitive. Recommendations are made by the Commission, but the final decisions rest with the Board of Foreign Scholarships in Washington.

The basic criteria for the award of a travel grant are as follows:—

Applicants must hold a good university degree or recognised professional qualification prior to actual departure. Applicants must possess a guarantee of financial support in dollars for the proposed period of the visit to America. They must be citizens of the United Kingdom or Colonies, and are expected to return to reside permanently in their home countries.

Graduate students must show proof of admission to an American institution of higher learning for a minimum period of nine months. In the case of medical internships, the hospital to which the applicant hopes to go must be acceptable to his registration body in the United Kingdom. Candidates should be free of National Service obligations. Grants to graduate students are valid for a period up to three years, but they are subject to annual renewal over this period.

Professors, lecturers and senior research workers must intend to spend at least three months in the United States (exclusive of transatlantic travel time), of which about two-thirds should be spent at one university or recognised research institution. Proof of affiliation is necessary. Grants cannot be given for attendance at conferences alone. Grants may be extended up to a period of two years, subject to satisfactory appointments and continued dollar support. Four years must elapse from the date of return from America before a second application may be made for a Fulbright travel grant.

These travel grants are available for travel to America between June 1st, 1955 and February 1st, 1956. All travel grants cover the cost of direct travel between a candidate's home in the United Kingdom or Colonies and the destination in America. No allowances are made for dependents' travel. Since the funds of the Commission are in non-convertible sterling, it is not possible to offer grants for maintenance, tuition or incidental expenses within the United States.

There are two closing dates in this competition dependent on the departure date. They are: March 15th, 1955 for those travelling between June 1st and July 31st, 1955; and June 1st, 1955 for those travelling after August 1st, 1955.

Those wishing to apply are first asked to fill up a record card. This in itself does not constitute an application. Full-length application forms are sent only when candidates indicate that their plans are complete, which must be before the appropriate closing date. Full-length applications should be submitted via the Head of the candidate's College or University or employing body.

Record cards and application forms may be obtained from: United States Educational Commission in the United Kingdom, 55, Upper Brook Street, London, W.1.

TUBERCULOSIS ERADICATION IN THE ISLE OF MAN

The position with regard to the eradication of bovine tuberculosis in the Isle of Man, up to September 30th, 1954, is as follows: total cattle population, 24,737; number of cattle in attested herds, 20,555; percentage, 83 per cent.

THE PESTS ACT

The Pests Act, which provides for the more effective control of wild rabbits and for ending the use of gin traps after July 31st, 1958, received the Royal Assent on November 25th.

Under Part I of the Act, rabbit clearance areas may be set up in which it will be the duty of occupiers to keep their land free from rabbits. A start will normally be made with areas of about 10,000 to 20,000 acres, in which rabbit control should present no special problem, for example districts in which myxomatosis has taken a heavy toll and which are bounded by rivers or other barriers to re-infestation.

Part II of the Act deals with trapping. It will be an offence to use a gin or other unauthorised trap after July 31st, 1958; and it is hoped that by then the Humane Traps Advisory Committee will have developed and arranged for the provision of an adequate supply of effective humane traps.

The Myxomatosis Advisory Committee recommended that whenever outbreaks of this disease occur some rabbits may be expected to survive and every advantage should be taken of this unique opportunity to eliminate the survivors before they build up in numbers again. The Government has, however, made it clear that myxomatosis is not the complete answer to the rabbit problem; and further that it is opposed to the deliberate spreading of the disease. To emphasise this view, the Act makes it an offence to use an infected rabbit to spread the disease to uninfected rabbits.

SECOND CONGRESS PAPER

The Present Position with regard to Bovine Mastitis and a Review of Recent Trials of Various Antibiotics for Bovine Mastitis

BY

C. D. WILSON

Veterinary Laboratory, New Haw, Weybridge, Surrey

This paper was discussed at Congress on the afternoon of Tuesday, September 21st. Mr. J. M. Ingram, M.R.C.V.S., was in the Chair, and the Recording Secretary was Mr. S. R. Campbell.

IN opening the meeting the Chairman said it was a pleasure to introduce Mr. Wilson. Mr. Wilson really did not need much introduction, and those at least in the south-east knew him particularly well, to their great benefit. They would all be pleased to hear his introductory remarks.

Mr. Wilson said: In the first paragraph of this paper I made the statement that mastitis is even more with us to-day than it was three years ago, and there will be few among you here to-day who will not subscribe to that view and more especially if I qualify it by putting the word summer in front of mastitis.

Just why there should have been such a widespread attack of this form of mastitis this year is hard to explain. Obviously, one blames the weather, but what part has the weather played? Has it lowered the resistance of the cows from lack of sun and repeated soakings with rain? Has it increased the number of flies, and has it produced in late summer an abundant growth of herbage on pastures which are normally bare at this time of year?

This type of mastitis is a subject in itself, and has occupied research workers at Weybridge for many years. Weitz has shown the futility of prophylactic treatment using a *C. pyogenes* toxoid or vaccine, or both combined, while Stuart has demonstrated the varied bacteriological picture which can be found in cases of summer mastitis. In addition to *C. pyogenes* he recovered *Str. dysgalactiae*, an anaerobic streptococcus, *Str. indolicus*, and a symbiote growing in association with *Str. dysgalactiae*. Using a combination of these organisms he was able to reproduce the disease in a much higher percentage of dry cows than when using *C. pyogenes* alone, and he was able to demonstrate good protection when using a live compound vaccine.

For two years experiments were carried out from Weybridge to determine the prophylactic effect of penicillin when given to cows during the dry period, but the results were disappointing, since it only needed a decision to be made to choose susceptible herds in a high incidence area for the disease to disappear almost entirely during the period of the experiments. The results did suggest that penicillin was of value used in this way, and Pearson, in Northern Ireland, had similar results but of much greater significance. There have been reports from veterinary surgeons who have been adopting the practice of drying-off cows in the danger period with penicillin, that it has been of value in this present outbreak, and a further experiment is being carried out with penicillin with the help of the Veterinary Investigation Officers to determine whether significant results can be obtained. Half the cows in each herd are treated with 300,000 units of penicillin each fortnight while they are dry, with the other half left untreated as controls.

At the same time work has started at Weybridge to determine the rôle that flies may play as vectors of this disease. This work is, however, only in its initial stages.

There can be no argument that summer mastitis is a very important disease economically, but it must be kept in perspective. The spectacular nature of the disease, the almost inevitable loss of any infected quarter, the possible loss even of the cow, bring home very sharply the sense of loss, but even more important to the country economically is the loss of potential yield in our dairy herds from cows which are sub-clinically affected with the common mastitis organisms, such as *Str. agalactiae* and *Staph. pyogenes*.

Figures have already been published indicating the increased yields which have resulted when herds have been freed from *Str. agalactiae*, and yet there has been little use made of the free-sampling facilities which are available in the Veterinary Investigation Centres.

In this paper I have tried to stress that mastitis is not usually a problem of the individual cow but of the whole herd, and requires treatment on that basis. We believe we have solved the *Str. agalactiae* problem, and while, in my opinion, it is tilting against a windmill to attempt to eradicate the other common mastitis pathogens because of their more varied habitat, they can and do produce much udder damage, much of it sub-clinical, and the problem they present must be solved.

We have evidence to suggest that control of this form of mastitis lies not so much in the realms of therapeutics as in the hands of the cowman. Good hygiene, sound milking technique, and a milking-machine which is well maintained and in good working order, will solve many outbreaks of mastitis which have resisted one form of treatment after another.

Coming to the use of antibiotics in mastitis, it is unfortunate that the number of cases treated is so small, but I hope you will agree that the indications were clear enough that no antibiotic alone has given indications of superiority over penicillin in treating a random sample of cases of mastitis. In this disease, with such a wide variety of causative organisms, the antibiotic that will replace penicillin must have both a broader bacterial spectrum and at least an equal efficiency in treating cases due to penicillin-sensitive organisms.

There is, however, an increasing number of cases of mastitis due to penicillin-resistant organisms, and at least on theoretical grounds the association of penicillin with other antibiotics, such as streptomycin, which act synergistically is to be commended, but the second antibiotic must be present in a therapeutic amount to account for those cases in which the organism is insensitive to penicillin and no synergism occurs.

The treatment of the future in this country will, in all probability, be as it is in the U.S.A. to-day, a combination of several different antibacterial substances, but I still maintain that greatest success in our fight against this disease-complex will be achieved not by therapeutics, but by preventive measures.

THE PAPER

Mr. Wilson's paper, which had been previously circulated, was as follows :—

IN a paper which was given to the Yorkshire Division of the B.V.A. in 1951, I stated that mastitis was like "the poor" and would always be with us. After a further three years, and even with the additional help of many new antibiotics, it would appear that mastitis is even more with us to-day than in 1951. With the introduction of penicillin and the sulphonamides came a marked fall in the incidence of clinical mastitis, but the curve has now levelled off and is perhaps even ascending again.

With the advent of the antibiotics, much success was achieved in curing cases of mastitis which were due to organisms sensitive to their action; but the curing of cases once they have developed should not be our chief aim. The target should be eradication of all forms of mastitis, and while this target may never be fully achieved, the prevention of disease is much to be preferred to curing one that has become established and must inevitably have caused damage.

Hughes has carried out a survey on all the clinical cases occurring in a practice in the Midlands and this valuable work has given us much useful information on the comparative incidence of different types of mastitis. However, the figures could be misleading since in 1953, the last year covered by the survey, there was a sharp drop in the number of clinical cases of mastitis from which he received samples. A natural conclusion from this would be that the incidence of mastitis had decreased but a more probable explanation of this decrease is that the farmers had gained access to antibiotics and frequently treated their own cows, only calling in professional help in the more resistant cases.

That clinical mastitis is as frequent to-day as it was a few years ago is an opinion that is held by many, but the proof of such a belief is lacking. Watts found in Ayrshire during the years 1938-50 that there was no alteration in the amount of mastitis due to organisms other than *Str. agalactiae* which had decreased from 33 per cent. to 12 per cent. Dr. Withers has kindly given me permission to publish figures of the incidence of clinical mastitis in three counties, included in his survey of diseases of animals. Unfortunately the number of herds is small, and the period of the survey is too short to give any marked trend, but the percentage of cases of mastitis given in Table 1 shows a slight increase from 1950-51 to 1952-53, and this would at least appear to deny any decrease in the incidence of clinical mastitis.

In a survey of the ecology of mastitis in Northumberland, Gray found that in 1943-44, 80 to 90 per cent. of cases of mastitis were due to *Str. agalactiae* while Hughes found that whereas in 1949 29 per cent. of cases were caused by this organism the figure had dropped to 16.5 per cent. in 1953. Thus, if it is accepted that the incidence of mastitis, apart from that due to *Str. agalactiae*, is not decreasing, it is obvious that the aetiology is undergoing change. While treatment of individual clinical cases will have beneficial results in restoring an affected quarter to milk-production, this is only putting out isolated flames without quenching the main fire.

TABLE I

CATTLE DISEASES SURVEY

CASE INCIDENCE OF CLINICAL MASTITIS FOR THE THREE-YEAR PERIOD OCTOBER 1ST, 1950 TO SEPTEMBER 30TH, 1953

		1950–51	1951–52	1952–53
Surrey	(1)	58	55	36
	(2)	1482	1406	1047
	(3)	7·9	6·8	8·6
Berks	(1)	64	58	41
	(2)	1970	1881	1388
	(3)	8·3	5·4	6·1
Wilts.	(1)	—	50	93
	(2)	—	1679	3549
	(3)	—	7·7	11·5
Totals	(1)	122	163	170
	(2)	3452	4966	5894
	(3)	8·1	6·6	9·8
Mean herd Strength Cows		28	30	35

(1) Number of Herds
(2) Average total cows
(3) Clinical Mastitis-case incidence per cent.

This position, in spite of the extensive treatment which has been carried out with antibiotics in recent years, is disappointing, but it is understandable.

Before clinical mastitis can develop in a cow, three conditions must obtain :—

1. The cow must be susceptible to mastitis.
2. The cow must be exposed to infection with an organism capable of invading the udder.
3. The conditions for such an infection to become established must be present.

If, by treatment, one causative organism is removed from a herd but the other two factors are still present then the incidence of mastitis will not be affected since other pathogens will be available to take the place of the one which has been eradicated. This is a generalised statement and, while it is substantially true so far as clinical mastitis is concerned, there are exceptions which must be noted.

In these isolated cases where an organism which is exceptionally virulent gains access to a herd, even relatively resistant cows kept under ideal conditions of management may succumb, but the removal of such an infection by treatment would not be followed by mastitis due to other infections.

In the case of *Str. agalactiae* which produces a mastitis which is largely sub-clinical and which is readily spread from an infected cow to a clean one, the removal of this infection will not necessarily be followed by a replacement with other types of infection. Dean and co-workers, Johnson and Murnane, all reported an increase in staphylococcal infections after the removal of *Str. agalactiae*, while Neave and co-workers showed that an increase or decrease in staphylococcal infections in herds free from *Str. agalactiae* could be associated with the type of liner in use. That the removal of *Str. agalactiae* is not followed by an increase in staphylococcal or other infection is indicated by results which were obtained in 25 herds which were under examination from Weybridge.

These herds were "blitzed" in 1947 with penicillin and infection with *Str. agalactiae* was removed. In 1951 they were re-examined to determine whether the removal of one pathogen had increased the chances of other pathogens to establish themselves in the udders. It will be seen from Table II that no such increase had occurred except in the case of *Str. uberis*. As the 1951 samples were collected in January, a time when *Str. uberis* infection is greatest, this increase is more apparent than real. It is of interest that in four of the 25 herds there was an increase both in infection rate with the other pathogens, and in the incidence of clinical mastitis, but all four were operating the same machine and using the same type of liner as Neave had incriminated in his paper.

TABLE II

BACTERIAL INFECTIONS IN 25 HERDS IN 1947 AND 1951

Organism	1947	1951
Str. agalactiae	338	11
Str. uberis	52	117
Str. dysgalactiae	58	40
Staph. pyogenes	81	86

Since the term mastitis is such an all-embracing one, it follows, if any progress is to be made in its control or eradication, that it must be classified in some way. It was frequently classified hitherto according to the causative organism, *e.g.*, streptococcal mastitis and staphylococcal mastitis, but this method is not helpful since so many organisms are associated with this disease and the same organism can be found in entirely different types of mastitis. Another method adopted was to split mastitis into two broad groups on an epidemiological basis and classify each infection according to whether it is contagious or non-contagious. This is an improvement, but in the "non-contagious" group were included many different infections, and while it would be unwise to propose too many sub-divisions, nevertheless this second group can usefully be split into two and mastitis can be considered under these three headings.

1. Contagious mastitis.
2. A-specific mastitis.
3. Acute sporadic mastitis.

Contagious Mastitis

This term refers to that form of mastitis which is spread during milking from cow to cow by means of the milker's hands, the udder-cloths and teat-clusters. The disease is sub-clinical as a rule and the organism usually responsible for this type of mastitis is *Str. agalactiae*. Other organisms, however, have been similarly incriminated, notably staphylococci, *Str. dysgalactiae* and *Str. uberis*. The control of this form of mastitis lies firstly in the hygienic measures taken to prevent spread of infection and secondly in the treatment of infected cows.

It has been shown by many mastitis workers that the eradication of *Str. agalactiae* from infected herds is possible and that such herds can be maintained free of this infection indefinitely. This is so because *Str. agalactiae* is an organism with a restricted habitat and apart from certain well-recognised sites such as teat-sores and human throats, it will not multiply outside the bovine udder.

The position with regard to the other organisms is more difficult. They are much more widespread and are capable of multiplying on the intact skin as well as being found in other species of animals and in other disease conditions.

Attempts have been made to eradicate staphylococci from infected herds. At Weybridge, Stuart, after he had infected the laboratory herd by means of milking the cows with infected teat-clusters, removed this heavy infection by treatment and maintained it free of infection for the next 18 weeks. Blackburn, working with the Hannah Institute herd, had similar results but both these herds were under strict supervision and precautions were taken to prevent the reintroduction of infection. In the general run of commercial herds such methods would be uneconomical and impracticable. The loss of milk ensuing from sub-clinical infection with staphylococci is probably considerable, and while an eradication programme seems to have little chance of success

it is possible that treatment of infected cows combined with hygienic precautions to limit spread of infection will have results sufficiently beneficial to justify this course even although retreatment may be necessary each year.

From Weybridge, one herd mainly infected with *Str. dysgalactiae* and one mainly infected with *Str. uberis* have been given mass treatment with penicillin. The herd infected with *Str. dysgalactiae* was freed from infection and remained so for two years but thereafter it reappeared although no bought animals had been introduced. In the case of the herd infected with *Str. uberis* the infection rate was reduced but never eradicated. It quickly re-established itself when treatment of the infected cows was stopped.

In herds carrying a heavy infection with one of these latter organisms, it is a moot point whether such infections really represent a contagious spread from cow to cow or are merely the result of one organism predominating because of greater adaptability to udder-invasion in circumstances where such an invasion is facilitated by some herd-factor which is lowering the resistance of the cows to infection.

A-specific Mastitis

In this group are included those cases where mastitis appears in a herd in a clinical form but where the organisms recovered from such cases are variable. If from successive cases of clinical mastitis occurring in a herd there is recovered a variety of pathogens it is obvious that it is not a case of contagious spread but rather that some factor is lowering the resistance of the cows to infection and the organism which is available at the time will find conditions suitable for invasion of the udder. In this group, as in the first group, infection is probably via the teat-canal but whereas we can control the contagious mastitis by hygienic measures, in this form such precautions are doomed to failure since we are dealing here with organisms which are normally present in the environment of the cows, which can multiply on the skin of the teats, and which will not be removed by the normal washing of udders.

When such a problem herd is presented, the remedy will not be in the realms of treatment. Here there is no single organism to attempt to eradicate nor can the spread of infection be interrupted because no spread exists. The line of attack must be in the direction of removing the exciting cause which is allowing organisms which are ever-present in the cowshed to invade the udders and produce mastitis.

In considering the factors which might be acting in this way, since it is a herd problem, the factors must be affecting the whole herd. Thus, while tramped-teats, horn-thrusts and overstocking are examples of factors which can predispose to mastitis they cannot be considered as being responsible for a herd mastitis problem since they affect the individual cow as a general rule and not the whole herd.

The most common herd-factor which can be associated with mastitis is milking-technique. As already mentioned Neave correlated staphylococccal mastitis with the use of a certain type of teat-liner; and in Surrey, of those herds which had a mastitis problem of an a-specific nature, in every case the trouble was associated with the milking-machine and was removed by alteration either of the milking-machine or its method of operation.

Acute Sporadic Mastitis

In this section are included all those infections which produce systemic effects as well as inflammation of the udder. In cases like this, the route of infection is problematical. Whilst some infections may enter via the teat-canal there are good grounds for believing that some may arrive via the blood-stream. The existence of this other route of infection has a decided influence on treatment, as the localised treatment in the udder for a condition which has its origin in some other part of the body cannot be expected to achieve good results.

Cases of sporadic mastitis are usually confined to isolated cows and examples of organisms which produce these systemic symptoms are *Str. dysgalactiae, C. pyogenes, Staph. pyogenes,* Group C streptococci (*Str. zooepidemicus*), *B. coli* and *Ps. pyocyanea.*

A significant point about these infections is that the majority of them can lead a saprophytic existence and it is reasonable to suppose that they will only develop a pathogenic rôle when conditions are exceptionally favourable. Hence they appear as single cases as a rule. In some herds, however, it is not because conditions are favourable but because a certain organism has become elevated in virulence that acute mastitis develops and in cases like these the majority of the herd may become affected.

That there is an increase in those infections in our herds cannot be disputed but as yet they have not reached a significant level. Perhaps this increase is most noticeable in the gram-negative infections and from cases of *B. coli, Ps. pyocyanea* being rare as they were only a few years ago, to-day they are almost an everyday occurrence. In the U.S.A. the mastitis flora have undergone a change which is even more spectacular than in this country, and the two explanations commonly given are firstly the indiscriminate use of antibiotics which are freely on sale to farmers, and the use of quaternary ammonium compounds. Such cationic detergents are more active against gram-positive organisms leaving the gram-negatives comparatively unscathed. The widespread use of antibiotics may also have induced a form of selection by removing the sensitive organisms and thus clearing the field for other organisms not affected by them.

The view has been expressed that the organisms which are normally found in cases of mastitis, by their greater adaptability to conditions in the udder outgrow other organisms less able to establish themselves but potentially more pathogenic and in that way act as a barrier to attacks of a more serious nature. Even if this were true, and it has been shown not to be to the case of *Str. agalactiae vis à vis* staphylococci, such a reactionary policy as to retain one form of mastitis to prevent the establishment of another is not one which should be advised. Each problem in mastitis must be solved as it presents itself and the fact that the eradication of one

infection reveals the damage that another one can cause is no argument for a policy of *laisser-faire*.

It is probable that the reason for the increase in the variety of infections of the udder is not a simple one. With the control of other cattle scourges such as tuberculosis, brucellosis and infertility, the milking life of dairy cattle has been increased and with this increase in age so also does the susceptibility to mastitis increase. With the increase in mechanisation of milking, cattle are exposed much more to traumatic damage. Dodd and Foot have shown that the faster-milking cows are potentially higher yielders, while, earlier, Dodd and Neave proved that mastitis was much more common in the faster-milking animals. As we select these higher-yielding faster-milking animals, we may, therefore, be increasing the susceptibility of our cows to mastitis. With all these factors operating to increase the risk of mastitis and with the antibiotics killing organisms sensitive to their action, it is understandable that the organisms not affected by the antibiotics will take advantage of the absence of competition in bovine udders. This is *not* an argument for leaving well alone but an underlining of the observation already made that treatment is not the final answer to our mastitis problem. If we kept low yielding, slow-milking cows and hand-milked them we should control our mastitis, but the aim in our herds must be to produce as much milk from as few cows as quickly as possible, allowing the less-productive herds to go into some other form of farming where there is no fear of over-production.

Treatment and Control

So far as contagious mastitis is concerned, the predominating organism is still *Str. agalactiae*. Its incidence in our herds varies in different parts of the country, being most common in the dairying counties. In Surrey where almost every herd in the county was examined, two-thirds of the herds were found to be infected and in one-third the infection rate was higher than 20 per cent. of the cows. This infection can be eradicated by treatment, and in four years the percentage of free herds in Surrey rose from 35 per cent. to 89 per cent. The establishment of herds free from *Str. agalactiae* is possible on a large scale at very little cost either in money or labour and much saving in milk would result if veterinary surgeons would make use of the facilities available in the Veterinary Investigation Laboratories for diagnosis of infected animals without which an eradication scheme is useless.

For treatment of *Str. agalactiae* mastitis it is probable that penicillin will always be the antibiotic of choice. It is cheap, non-irritant and non-toxic and no strain of *Str. agalactiae* resistant to its action has yet been recovered.

For a-specific mastitis, while treatment of individual cases of mastitis is advisable, the remedy for the herd problem lies in the hands of the farmer and his cowman. Theirs must be the job of ensuring that the cows are properly fed, watered and housed, protected from external injuries and milked efficiently with a machine which is maintained in good condition. Most milking machines are serviced free for a year after purchase, and thereafter no attention is given to them unless there is a breakdown. As serious faults can develop quite gradually, it would be a wise plan if every milking machine were inspected by a service engineer at least once a year.

So far as treatment of clinical cases is concerned, of recent years the tendency has been for the farmer to carry out preliminary treatment himself and to call in professional help only for those cases which do not respond to treatment. It is hard to stop this practice and impossible to do so unless it can be shown that such unskilled interference may be detrimental to the cow. Farmers must be made to appreciate that when an animal, the profit from which is derived from its milk yield, develops mastitis it is sound economy to call in skilled attention at the outset.

The increase of *Ps. pyocyanea* infections in the United States is due in some degree to the "drug-store" sale of mastitis therapeutics while in this country we are having an increasing number of cases of mastitis associated with yeast-like fungi and the rapid-growing acid-fast organisms described by Harvey and Stuart. These cases are usually, if not always, a sequel to treatment for some other form of mastitis, and for this reason alone the prevalent practice of allowing farmers to have a supply of penicillin or other antibiotics is dangerous.

For the veterinarian the approach to cases of mastitis must not be stereotyped. Mastitis is usually a herd problem and requires treatment on a herd basis. Even for treating the individual case, injecting an antibiotic into the teat-canal after examination of the animal is not very far from empirical treatment. In the first instance treatment must be to some extent based on conjecture but, while therapy via the teat-canal will probably suffice for the majority of cases, for others, parenteral treatment will be necessary. Since treatment would be influenced were the causative organism known, it is sound practice to collect a milk sample from each cow before it is treated. In the great majority of cases the examination of a film made direct from the milk will give an indication at least of the broad group into which the causative organism falls. If milk samples are sent to a laboratory, the report is of necessity delayed and is usually only of historical interest but it does confirm the microscopical diagnosis and is valuable in the cases which do not respond to treatment.

The choice of therapeutic is a matter to which more attention should be given. Apart from a few well-defined cases it is usually impossible to tell the nature of the infection from an examination of the udder. Accordingly whatever treatment is used must be effective against as many different types of organism as possible. This would appear to favour the use of broad spectrum antibiotics such as aureomycin but in this country the majority of our cases of mastitis are associated with gram-positive organisms and such organisms are usually sensitive to penicillin.

An important exception to this is that of recent years there has been an increase in the number of strains of staphylococci which are resistant to penicillin. At Weybridge in the last six months, 946 strains have been examined and 370 (39 per cent.) proved to be more resistant than a standard sensitive strain. This resistance varied from strains which are inhibited by 0.1 units/ml. (only slightly more resistant that the sensitive strain) to strains which grow in 250 units/ml. of penicillin. In 1945 Murnane reported that all his strains of staphylococci were sensitive to penicillin while Aynsley in a survey of strains of staphylococci from clinical cases in the Midlands found all 116 strains to be sensitive to penicillin.

Hughes in this survey of clinical cases found that over five years the percentage of cases due to *Staph. pyogenes* was 12.55 per cent. while Stableforth quoting figures for 1952 from over 2,000 cases found that 18 per cent. were due to this organism. Because there was some degree of selection in the samples reported on by Stableforth since they were from cases in many different practices and there would be a tendency to send in resistant cases, it is probable that the figure of 18 per cent. is too high. However, it is interesting to note that Hughes's figure for 1948 was 11 per cent. and it had increased to 16 per cent. by 1953. In this year the farmers were treating many cases themselves and the increase much more probably derives from selection of cases than from a real increase in the number of cases due to staphylococci.

Despite that, this selection occurs before a veterinary surgeon is called in and he will have to deal with an increasing number of staphylococcal cases and an increasing number of these which will be resistant to penicillin. For this reason it has become apparent that we must find some more active method of treating cases of clinical mastitis. Accordingly, it was decided at Weybridge that the newer antibiotic preparations which have been discovered in recent years should be examined to decide whether any of them possessed marked advantages over the standard treatment with penicillin.

Since, as has been mentioned, it is usually impossible to establish the type of infection from the clinical symptoms, it is essential that any new form of treatment introduced must be better than penicillin in treating all types of mastitis. It is not sufficient that a preparation is effective against *B. coli* mastitis where penicillin is useless if the same preparation gives much worse results than penicillin in treating a more common infection such as *Str. uberis*.

Apart from penicillin the antibiotic most in use has been aureomycin and while this product is more irritant than penicillin it was claimed to be much superior in its action especially in cases of staphylococcal infection. Packer found that aureomycin was of value in chronic staphylococcal mastitis, freeing 34 per cent. with a single dose of 22 μg. while 68.5 per cent. were freed when two doses were given usually at 48 hours interval. Slanetz found aureomycin was effective against both streptococcal and staphylococcal mastitis but that it normally required two injections for the latter infection as against one for the former.

Hulse treated 10 cases of acute staphylococcal mastitis with 2 x 420 μg. of aureomycin at 48 hours interval and restored seven out of 14 quarters to normal yield. Schalm, however, found that aureomycin had no advantage over penicillin in treating cases of mastitis due to *Staph. pyogenes*. Spencer and co-workers showed that in the treatment of streptococcal mastitis there was no advantage in using a mixture of penicillin with sulphadiazine, aureomycin or bacitracin over penicillin alone.

In his attempt to eliminate staphylococci from a herd, Stuart treated all the cows in milk (12) with 420 μg. of aureomycin daily for four days and removed the infection from 17 out of 18 quarters. The cow resisting treatment was removed from the herd which then remained free for 18 weeks when the infection returned. This treatment produced a serious drop in milk yield which was continued for four weeks after treatment had been completed. He noted that micrococci and diptheroids, which after penicillin treatment return to their original numbers in two to four weeks, were almost entirely eliminated and remained at this low level for the 18 weeks of the experiment.

Since terramycin and aureomycin have been shown to be allied, sharing a common active principle in tetracycline, the results obtained with aureomycin apply equally to terramycin. Cotten reports, however, on a case of *Ps. pyocyanea* mastitis with systemic symptoms which responded to intravenous terramycin while Tableman reported on eight cases of mastitis which responded favourably to this antibiotic.

Neomycin is an antibiotic limited in its application by its toxicity but it was hoped that use could be made of it in mastitis since it would not be absorbed from the udder in toxic amounts and because of its broad antibacterial range. First reports by Drury were encouraging. He treated 405 cases of mastitis and found it to be effective against infections caused by yeasts, streptococci, staphylococci, coliforms and *Ps. pyocyanea*. Tucker, however, found that neomycin was not as effective in treating streptococcal or staphylococcal cases of mastitis as penicillin but found it effective in treating 40 per cent. of 43 quarters infected with *Ps. pyocyanea*.

It has been common practice for years to combine streptomycin with penicillin for mastitis therapy. There are strong theoretical grounds for this because of the known synergistic effect which streptomycin produces with penicillin. Thus Bryan, Foley, and Cooper all used this combination with success in various types of infection but they carried out no comparative trials.

Chloramphenicol is another antibiotic whose general use is restricted by its toxicity. According to Finland, while it is usually much less active against staphylococci than penicillin and the tetracyclines, strains of moderate or high resistance to it are rarely met. It has been reported that a true synergism exists between chloramphenicol and sulphone (28) and this combination has also been used in the field trial about to be described.

A significant feature of many of the previous experiments which have been carried out has been the lack of controls against which it would be possible to assess the results obtained. Furthermore, the yardstick of success has been either on a bacteriological basis or on a clinical basis but seldom on both. Accordingly the method used at Weybridge for each new form of treatment was that it should be compared with penicillin and assessed both on clinical and bacteriological grounds for its ability to effect a cure in a random sample of mastitis cases. Each case was to be treated according to a strict rotation so that there would be no selection of cases as being likely to be more suited to one form of treatment than another. As a general rule three preparations were used together with penicillin by each veterinary surgeon who co-operated in the field trial, and the rotation was adhered to but not strictly in cases of summer mastitis where the desire to use a new preparation in the hope of a cure was too strong.

Before treatment a milk sample was collected and sent to the laboratory, and the clinical pre-treatment data were noted. A week after treatment a second milk sample was collected and sent in, together with an assessment of the clinical results of treatment. For convenience in setting out the results the symptoms were graduated in four types, and similarly there were four grades of recovery after treatment. The bacteriological result was analysed in three ways: pathogens removed, pathogens still present or, as so often happens, no pathogens present at either examination. A specimen form is shown in Figure 1.

In carrying out a field trial of this nature where cases are treated in general practice, the question of economics must be considered, and so far as this field trial was concerned, the veterinarians co-operating reserved the right to use additional measures in those hyperacute cases where the animal's life was endangered. This has limited the number of such cases included in the results as those reported are cases which have had only one type of treatment at any one time.

So far as the dose was concerned, it was felt, since the products which were being tested would eventually be made available to the profession, that the recommendations for administration should be left to the suppliers of each product lest the trials should be criticised on the grounds of inadequate treatment. For penicillin, no definite form of treatment or formulation was laid down and it was left to each veterinary surgeon to use it in the manner which he had found to be most effective.

At first, three antibiotic preparations were compared with penicillin and were used as follows.

(1) Aureomycin

One tube of 420 μg. per infected quarter. This was altered to one tube daily for four days after the first few cases.

(2) Chloromycetin

One tube containing 4 ml. of a 5 per cent. suspension into each infected quarter daily for three days.

FIG. I

MASTITIS FIELD TRIAL — REPORT FORM

Method of Treatment

Aureomycin		Chloromycetin	
Dapsetyn		Penicillin	

Veterinary Surgeon : Owner :

Cow Quarter

Dry | | Date of last calving
In Milk | |

re-treatment

Bacteriological Examination Date :

Clinical Symptoms

Hyperacute with systemic disturbance	1
Acute hot and painful quarter but little or no systemic disturbance	2
Clots in milk, little or no pain or swelling	3
Quarter indurated, no pain, few or no clots	4

Previously treated by other means

Yes	1
No	2

Post-treatment Date :

Bacteriological Examination

Clinical Result of treatment

Complete recovery	1	Good recovery	2
Some improvement	3	No improvement	4

Bacteriological result of treatment

Pathogens removed	1	Pathogens still present	2
No Patnogens at either examination	3		

(3) Dapsetyn

One tube containing 15 μg. of chloramphenicol and 30 μg. of dapsone into each infected quarter daily for three days. For cases of "summer mastitis" in dry cows one tube twice daily for five days into each infected quarter.

Subsequently, three other preparations were included in this field trial, *viz.* terramycin, neomycin and streptopen but too few cases have been treated as yet to warrant including the results in Tables III and IV. Preliminary results, however, have not indicated that any of these will give better results than those on which the trials have been completed.

Table III analyses the results obtained with the first three preparations and penicillin both on clinical and bacteriological grounds, while in Table IV the aetiology of the cases treated with each antibiotic is summarised.

In assessing these results, consideration must be given to the fact that whereas only three cases treated by penicillin were known to have had previous treatment, for chloromycetin, dapsetyn and aureomycin the figures were 10, 7 and 26 respectively. Furthermore, there were no cases of "summer mastitis" in the group of cows treated with penicillin and this has also tended to favour penicillin since none of the cases of this type rated higher than a grade 3 recovery irrespective of the treatment and previous experience has indicated that penicillin would not have been any better.

From these figures none of the new therapeutics has established a claim over penicillin in treating a

random sample of cases of mastitis because the majority of such cases are still due to penicillin-sensitive organisms. If specific infections are considered, however, then for cases of staphylococcal mastitis, aureomycin would be the antibiotic of choice since 16 out of 24 cases were freed from infection with it against 0 out of 9 with chloromycetin, 3 out of 9 with dapsetyn and 5 out of 15 with penicillin.

So far as treating streptococcal infections was concerned no new preparation was better than penicillin gious forms and especially for *Str. agalactiae* mastitis, an eradication programme based on bacteriological examination of milk samples and treatment of infected cows is the answer; but for the a-specific and acute sporadic types control will always come from good management, hygiene and cowmanship.

For treatment of clinical cases of mastitis, it would appear that there is as yet no improvement over penicillin among the more recent antibiotics but such an improvement is called for in view of the increasing number of cases in which penicillin will not be

TABLE III

COMPARISON OF ANTIBIOTICS IN MASTITIS TREATMENT

	Previous treatment		Clinical symptoms				Clinical response to treatments				Bact. result of treatment			No. of cases
Antibiotic	1	2	1	2	3	4	1	2	3	4	1	2	3	
Aureomycin	26	26	10	19	25	13	17	19	17	13	28	21	17	66
Chloromycetin	10	26	4	19	13	7	19	5	9	10	8	27	8	43
Dapsetyn	7	27	8	10	14	11	21	8	7	10	21	15	10	46
Penicillin	3	33	2	14	22	8	20	15	8	3	23	12	11	46

TABLE IV

ANALYSIS OF BACTERIOLOGICAL RESULT

Antibiotic	Str. agalactiae	Str. uberis	Str. dysgalactiae	Staph. pyogenes	C. pyogenes	B. coli	Other infection	Sterile
Aureomycin	2	8	7	24	5	2	2	17
Chloromycetin	2	5	10	9	7	2	—	8
Dapsetyn	3	3	6	9	5	6	6	10
Penicillin	7	5	4	15	—	2	2	11
Totals	14	21	27	57	17	12	10	46
	(7·3%)	(10·3%)	(13·2%)	(27·8%)	(18·3%)	(15·8%)	(4·8%)	(22·5%)

while all were useless against established cases of "summer mastitis." It is noteworthy that dapsetyn removed the infection from six cases of *B. coli* mastitis restoring five to normal milk production, a result which was not achieved by any of the others.

Discussion

Despite having many more guns in our battery to attack it, clinical mastitis has not decreased to any marked extent, if at all, in the past few years. The reasons for this are varied. The longer milking-life of our cows, the changeover from hand to machine milking, and the selection of fast-milking cows are all factors which can play a part in making cows more susceptible to mastitis. In counties such as Surrey where *Str. agalactiae* mastitis has been tackled seriously, the problem has been reduced considerably, but having done that, there still remains a significant degree of mastitis due to other organisms, and this is not getting less.

Mastitis is nearly always a herd problem and demands treatment on a herd basis. For the contaactive. A review of the literature has discovered very few trials in which the antibiotics were compared one with another. When this has occurred, no other antibiotic has given results superior to penicillin in treating a random sample of cases of mastitis.

Where infection enters via the teat-canal, as Pattison has shown, the bacteria are present in the milk ducts and only penetrate the submucosa during a clinical attack where they are killed quite rapidly. Thus in therapy via the teat-canal, antibiotics depend for their action on their ability to diffuse throughout the duct system of the udder. In treating mastitis, an antibiotic may fail to perform its function, not because the causative organism is resistant but because the histo-pathological changes in the udder prevent diffusion to the foci of infection. To counteract this, it would be sound practice to incorporate a penetrating agent in the vehicle in which the antibiotic is suspended or to inject the antibiotic intramuscularly in sufficient amounts for it to pass through the blood milk barrier and produce a lethal concentration in the milk.

On the surface it would appear that if penicillin alone gives good results, the addition of another antibiotic with a wider range of action would at least have an additive—if not a synergistic—action. Unfortunately, this is not the case. While it can be demonstrated *in vitro* that the addition of streptomycin to penicillin will increase its bactericidal rate in a synergistic manner, the reverse is true if broad spectrum antibiotics, such as aureomycin, terramycin and chloramphenicol are added to penicillin. That this antagonism also occurs *in vivo* can be demonstrated in mice but it is confined by time and dose relationships and clinical reports of such antagonism occurring are sparse. Furthermore, a combination of two antibiotics may be antagonistic when acting on one organism and synergistic when acting on another. Even different strains of the same species may behave differently.

Because of the varying behaviour of organisms to antibiotics, therapy in human clinical medicine can be administered after a preliminary sensitivity plate has indicated the antibiotic or combination of antibiotics which would be most effective, but such facilities are not practicable usually in veterinary medicine. Our need, therefore, is for a therapeutic which will be effective in treating every case of mastitis irrespective of its cause, and so far no antibiotic or combination of antibiotics has given results superior to penicillin.

Summary

Clinical mastitis remains a serious economical problem in this country. With the introduction of penicillin a significant reduction in cases occurred, but this improvement has not been maintained. The reasons for this are discussed and it is suggested that mastitis as a herd problem should be considered under three headings: contagious mastitis, a-specific mastitis, and acute sporadic mastitis.

For the contagious form, eradication of infection based on good hygiene, bacteriological examination of milk samples and treatment of infected cows is the answer; but for the other two forms, while treatment of established cases is essential, prophylactic measures based on good management and milking technique are advised.

Because of the efficiency of penicillin in treating streptococcal mastitis the bacterial flora in cases of mastitis is undergoing change and gram-negative infections are more frequent than they were. This has prompted a field trial of the more recent antibiotics to test their efficiency in producing bacterial and clinical cures in cases of mastitis but none examined so far has shown any improvement over penicillin in treating a random sample of such cases.

Acknowledgments

I should like to express my gratitude to those veterinary surgeons, too numerous to name individually, who co-operated with us at Weybridge in the antibiotic field trial. My thanks are also due to Mr. F. B. Leech for his help in preparation of the form used in the field trial.

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THE OPENER'S SPEECH

MR. J. D. DUNN, M.R.C.V.S. (Wadebridge), in opening the discussion, said: Firstly, let me congratulate Mr. Wilson for presenting a paper so comprehensive, yet concise, on the present position with regard to bovine mastitis, a paper which embodies a lot of research, made by himself, into this problem.

I have been asked to open this discussion from the point of view of the practising veterinary surgeon. How do these constant experiments and new drugs affect the position of the man in the field?

Let me say at the start, I agree wholeheartedly with the author's remarks that mastitis will always be with us, due largely to mechanically-milked, high-yielding cows.

That the milking machine plays its part in the spread of mastitis cannot be gainsaid, but the length of time the cluster is left on is as important as the type of liner in use, in my opinion.

Each cow varies in the time it takes to let down its milk, and the person in charge should know this time factor of each animal in his care. In other words, machine-milking should be as personal an affair with regard to the individual cow as hand-milking.

Trauma of the udder, caused by leaving teat-cups on after all the milk has been let down is the condition, above all, for any infection to become established there.

Regarding the susceptibility of a cow to mastitis, I would put it to Mr. Wilson that those high-

yielding, fast-milking cows have an inherent tendency to those conditions which are ideal for mastitis to develop; and I would be glad to know if he has any information about this matter. I ask because it has been my experience that the incidence of clinical mastitis always seems greater on those premises where good hygiene and milking technique are practised than on those on which the facilities are not so ideal. I suggest that in the latter cases the herds are not composed of such high-yielding members as in the former.

I agree with the author that veterinary surgeons should make more use of the laboratory facilities offered by the Veterinary Investigation Department, but in some of the remoter districts the report is only of academic value by the time it is received, and treatment has had to proceed meantime on the lines of clinical findings, perhaps supported by a rough microscopic check by the veterinary surgeon himself, and by trial and error.

This is a very good argument put forward for the establishment of more of these laboratory centres, especially in those places where the existing ones are so far in time and distance.

The field trial carried out at Weybridge, where the other more recent antibiotics—aureomycin, chloromycetin, and dapsetyn were compared and assessed clinically and bacteriologically with penicillin, in random sample mastitis cases, was interesting and significant in the conclusions reached. I should like to be so bold as to suggest that in any future trials of this sort, the incorporation of a comparison with other forms of treatment, apart from antibiotics, such as sulphonamide, would be valuable and instructive. I have long had the feeling that, with the introduction of one new antibiotic after another, we tend to become dazzled by them and to lose sight of the other, perhaps older, but none-the-less valuable treatments.

Finally, I should like to comment on the findings in regard to *C. pyogenes* mastitis, that none of the antibiotics employed were able to restore affected quarters to milk production in established cases. I think this is the experience of all of us in the field, and it is a problem which has come very much to the fore in recent months. It is very difficult to have to give more gloomy prognoses to owners who think that with all those wonderful new antibiotic drugs, surely something can be done to save the quarter and look hopefully to us to do it.

In this connection I should like to ask Mr. Wilson if he has done, or knows of any work which has been done to determine whether any oestrogenic disturbance in the dry cow, perhaps brought about by plant oestrogens in the summer, makes the udder more sensitive and susceptible to infection.

I should also like to know if any work has been done experimentally in the parenteral administration of antibiotics in those cases of summer mastitis where extreme damage to udder tissue makes diffusability of drugs via the teat canal virtually impossible.

In connection with this fibrosis, I should like to ask Mr. Wilson also if he has got any data on the use of a drug, such as iodine, to reduce this excess tissue, remembering that drug's action in this connection in other conditions.

I shall now take up no further time, as I am sure Mr. Wilson's paper is going to evoke a lively general discussion.

THE DISCUSSION

Mr. K. D. Downham, B.V.SC. (Liv.), D.V.H. (Cirencester), said that he wished to express his thanks for a very instructive paper. For the last three years he had had the opportunity of working with a very high producing herd, in fact, the highest producing small herd in the country, and there were some mastitis problems he had attempted to tackle.

At the Royal Agricultural College there was a great opportunity of working with very good cows under Professor Boutflour, who had done much for the dairy industry and, although not everybody agreed with all he said, they all could learn a very great deal from him. That remark was made because perhaps Professor Boutflour felt a little sore at the way in which some of his remarks and some of his teachings had been criticised by some members.

At the moment the College had the highest yielding dairy cow in the country. She frequently gave 14 gallons a day during her last lactation, sometimes 13½ gallons, and she was milked three times daily; two years ago this animal had summer mastitis. The herdsman said she was worth spending a little money on, and Mr. Downham proceeded to treat her with large doses of sulpha drugs and penicilin.

She was given very large doses of penicillin intramuscularly, 10,000,000 units in the morning and 5,000,000 in the afternoon. She had 100,000 units of penicillin in each quarter every eight hours. She was given also 60 gm. of M & B soluble and a course of sulphapyridine with other of the sulpha drugs in combination; altogether she had about 50,000,000 units of penicillin intramuscularly.

Six weeks later she calved twins, producing perfectly normal births, and proceeded to break the record. She then calved again, and so far had given a very good milk yield which amounted to very nearly 3,000 gallons already and she had still not finished her lactation. The reason for drawing attention to this case was that as a profession, Mr. Downham thought they rather neglected some of the systematic lines of treatment for summer mastitis with new drugs.

The second thing he found useful was hyaluronidase, an enzyme, for softening the fibrous tissue in the udder. One cow so treated returned to giving 8½ gallons per day, after having two quarters almost completely solid with blood clot following an injury. He considered it was a very valuable adjunct in certain cases of mastitis. He had used it for summer mastitis successfully, and during the past summer there had been plenty of opportunity; good results were sometimes obtained with a combined treatment of streptomycin and sulphapyridine in large doses, and he always used penicillin on all dry cows as a precaution. There seemed to be more tools in their hands for use against summer mastitis than some people thought.

Mr. E. P. Barrett (Guildford) said that in summer mastitis it was important to define what the organism causing the condition was. Mr. Downham had not told them and they did not know quite what he was treating. Mr. Barrett had experience of two in-calf heifers which developed summer mastitis. The clinical symptoms were the same in each animal—a high temperature, a hard, painful quarter, stinking secretion, in fact all the usual symptoms of summer mastitis. The line of treatment employed was to inject an aqueous solution of penicillin and sometimes streptomycin as well—something like 2,500,000 or 5,000,000 units—into the tissue of the udder. One animal went back rapidly to complete normality; in the case of the other there was no alteration. When the answer to the samples came back it was found that the one that recovered was *dysgalactiae*, and the other was *C. pyogenes*.

In a limited number of herds, from which clinical mastitis had disappeared as a result of treatment in the scheme conducted under Mr. Wilson's able supervision, repeated milk sampling showed a particular cow to have persistence of *Str. agalactiae* in the udder. Could Mr. Wilson explain the extraordinary difficulty of eliminating the infection from such a cow?

Dr. J. K. L. Pearson (Belfast) said that the subject of summer mastitis seemed to be topical. It certainly had been topical in Northern Ireland in the past year and, indeed, for very many years. It had occupied a fair amount of his time since he went there in 1943. At that time Mr. Angus Foggie and Dr. Lovell had begun a campaign against the disease using an alum-precipitated toxoid. The effects of this toxoid in preventing the disease were studied in an experiment involving over 4,000 cattle during the next three years. It was a big task, as many of the farms were small in Northern Ireland and it was necessary to travel a lot, often for very little. Occasionally only one animal was suitable for inoculation on one farm, another animal being left as a control. The results in the end were about 50/50 and resulted in a search for new methods of control.

The bacteriology was studied and the results were slightly different from Stuart's at Weybridge. There was no doubt that *Corynebacterium pyogenes* itself was not the only organism concerned in summer mastitis and this was perhaps one reason why the toxoid did not work. A considerable number of *Str. dysgalactiae* infections were discovered.

One important finding was that about 10 to 12 per cent. of the secretions from summer mastitis cases were sterile on bacterial culture. That might have had something to do with the technique, but surely not in 10 to 12 per cent of about 700 samples. Perhaps this finding was a guide to the fundamental cause of summer mastitis. It might not be a bacterial one and Dr. Pearson did not personally think that it was.

The season as a predisposing cause was important. The disease was called summer mastitis for an obvious reason and it was studied by Dr. Pearson and his colleagues in 1947 and 1948 very particularly from this aspect. Hourly temperature and humidity readings were taken from a meteorological centre over a period of two months and correlated with the incidence of summer mastitis cases as they occurred daily round about. A common factor could not be found, except that in both years the outbreaks came to a head about ten days after a very hot spell. During a hot spell there was a very high humidity at night and a low one during the day, and the considerable contrast between night and day temperatures might be the disturbing factors responsible.

Dr. Pearson saw the same thing in Scotland and it was in this country—in 1943—that he first saw the summer mastitis syndrome in winter. The trouble appeared in February and March during a warm period, though it occurred at that time of the year mostly in milking cows.

Nowadays one managed to prevent summer mastitis to a large extent by the injection of penicillin oily compounds into the udder, from the end of June onwards, giving it every 14 to 18 days. It must be given periodically, however—one udder injection not being sufficient.

The original idea of trying to prevent the disease in this way was to retain penicillin in the udder during the summer mastitis season and to give no organism a chance of growing. The results in practice were very good but it was considered that a reason for the success was perhaps the udder was sterilised by this method of injecting penicillin. In other words, there might be organisms there in very small numbers which acted on multiplication as exciting causes of the disease.

Another point of interest was the source of the *C. pyogenes* infection in the udder. Dr. Pearson was of the opinion it was not always through the teat. Perhaps the fly had been incriminated for too long with very little justification. He had seen in a heifer with a blind teat a typical case of summer mastitis except that the discharge had no outlet and it was highly suggestive that the *C. pyogenes* infection in this case was blood-borne. After all, look at the many other *C. pyogenes* infections encountered in cattle—in the uterus, lung, liver, joints, etc. most of these sites appeared to be affected via the blood stream.

He was very interested in Mr. Wilson's work on the "blitzing" of herds affected with *Str. agalactiae*. In doing work along those lines in Northern Ireland his own most significant finding was the increase noted in staphylococcal mastitis. In some of the herds, although the clinical position was bettered, the bacterial change towards staphylococcal mastitis was really alarming. There was still a grumbling mastitis problem in the herds, though it was significant to note that the overall use of penicillin in herds in the country had led to the fairly widespread disappearance of *Str. agalactiae*.

Dr. P. S. Blackburn (Ayr) said that he wanted first to congratulate Mr. Wilson on the admirable paper he had given, in which the really important points about mastitis had been so clearly pinpointed. So far the discussion had been mainly on summer mastitis, but even this summer would soon be over, and other types of the disease were going to become more important in the next month or two. His interest was chiefly in sub-clinical mastitis caused by staphylococci, and one of the difficulties with the latter was the problem of re-infection which so readily occurred two or three weeks after a case had been dealt with. Should they not emphasise to the farmer that washing the udder, so necessary in clean milk production, was in fact one method of spreading the disease unless the washing were properly done? It was surely essential to stress that unless the washing water contained a suitable disinfectant at the right strength and the udder cloths were allowed to remain in the washing water for a sufficient time for the disinfectant to work, the udder cloth could be a very potent means of spreading the disease.

Dr. S. J. Edwards (Compton) thanked Mr. Wilson for having compiled an excellent paper on an important subject. He had read it with great interest and felt that Mr. Wilson had drawn an important observation on the present-day status of mastitis, namely that while there was no increase in the number of clinical cases since the advent of antibiotic therapy, at the same time there was no substantial decrease. Mr. Wilson's experience with the field control of mastitis was very extensive and no doubt he was better informed than most workers on this subject, so that while his views regarding the prevalence of the disease would be accepted, his reasons in accounting for the change in aetiology and increased occurrence of sporadic cases might perhaps be open to question.

He attributed these to two factors, namely, the selection of high yielding cows which milked rapidly, and the result of penicillin therapy in the selective elimination of infection sensitive to its action more especially of that due to *Str. agalactiae*. Dr. Edwards would like to comment on these views by saying that in the case of the selection of cows, this must be an isolated attempt by a few farmers only and there could as yet be no general policy of eliminating cows because they were slow milkers. As regards the increase in the number of sporadic infections, it seemed to him that this was probably not due to the organisms responsible taking the place of *Str. agalactiae* as a result of treatment of individual cases, since they were probably increasing before the widespread use of penicillin began. Already in 1947, when this antibiotic was only beginning to be applied in the field, a survey carried out from Compton showed that out of a total of 41 herds examined only 17 were infected with *Str. agalactiae*. Since then many surveys in this country have shown that clinical cases due to *Str. agalactiae* have diminished but that the incidence of those due to gram-negative organisms has not materially changed since an early survey in 1930. But, on close analysis of these surveys, it could be seen that the only noticeable increase in clinical incidence attributable to infection was that due to staphylococci. The use of penicillin for eradicating *Str. agalactiae* from herds did appear to the speaker to be followed by an increase in the staphylococci and in such herds alone did he suggest that the change in udder microflora might be attributed to the use of penicillin. Mr. Wilson on the other hand did not agree with that

finding because the paper showed that the infection rate due to staphylococci before and after the disappearance of *Str. agalactiae* remained pretty well the same.

At the present time little was known about the control of typical *Staph. aureus* infection in the herd and one wondered at this stage whether it was possible or even necessary to control it on lines such as those adopted in the case of *Str. agalactiae*. The clinical disease, in Dr. Edwards's experience, occurred practically always in the newly calved cow and was generally of a subacute nature. The use of penicillin therapy seemed to give good results in such cases when treated at once, although it probably did not eliminate the causal organism in all cases. In addition to the obvious clinical case, however, *Staph. aureus* caused a chronic catarrhal mastitis in a large number of infected cows which probably resulted in a diminished milk yield, and for that reason it might be considered necessary from the economic point of view to eliminate it.

According to Mr. Wilson, the elimination of *Staph. aureus*, at least by penicillin therapy, would present a difficult problem since he had found about 39 per cent. of strains examined by him to be resistant to this antibiotic. While the speaker had not examined as many strains as Mr. Wilson, he had not up to the present found so high an incidence of resistant strains and those which were resistant belonged to a particular phage type which was not a common type in his experience.

Dr. Edwards was interested in field trials conducted by Mr. Wilson, who had found that penicillin gave about the same results as the other antibiotics, a result which agreed with his own experience in the treatment of staphylococcal mastitis. Mr. Wilson perhaps would not like to say, however, that penicillin was as effective as other antibiotics in the gram-negative infections and it would be interesting to hear what he thought of the individual antibiotics against the specific infections listed in the tables.

Mr. I. H. Pattison, B.SC. (Agric.) (Compton) wished to mention again the excellence of the paper. He said that as one who had tried to write briefly about mastitis he knew what a complex subject it was and how difficult it was not to be long-winded.

The conclusions in the paper were rather depressing. What was indicated, in effect, was that there was now as much mastitis as ever there was. It so happened that Mr. Pattison had spent eight years struggling with the mastitis problem, and it was almost suggested that he had been wasting time!

The paper expressed the opinion that the flora involved had changed, and with that Mr. Pattison entirely agreed. It was also stated that *Str. agalactiae* was not nearly such an important organism as it used to be.

Did the author feel that if all the knowledge now obtained were definitely applied in the field, including all the suggested measures for hygiene and milking technique, there would still be a mastitis problem? Also, if the problem would still be present under those circumstances, what did the author suggest was the best line to be followed by the research workers in the field of mastitis? Research in mastitis appeared to be in the melting pot, and a line of action was awaited from the people in the field.

Further, Mr. Wilson had been asked by a previous speaker if he could give any idea as to what was happening in those cows in which *agalactiae* persisted for years, could be isolated from the milk and yet not successfully treated. Mr. Pattison thought he might be forgiven for suggesting part of an answer to that point. He had made a histological examination of the udder in one or two cases, knowing *agalactiae* was somewhere. The organism was found in the wall of the milk ducts, lying in the intercellular substance, and in that position it would seem to avoid the antibiotic which was used.

Mr. J. B. Walsby (Midsomer Norton) said that he wanted to make a few random remarks as a practitioner. Regarding summer mastitis they had heard that perhaps they ought to consider some of the old drugs which included the sulphonamides, and mention was made of the use of sulphanilamide in particular. In the past season his experience of individual cases was that they seemed to be much more severe systemically than usual and a sure death seemed to be guaranteed if sulphanilamide was given. At the *post-mortem* one found a very large liver. He thought the normal dose of sulphanilamide for the very bad systemic cases was definitely toxic and caused death rather quickly.

He still thought that *C. pyogenes* mastitis was incurable. The damage was done before one got a chance to act. No drug could get through the barrier put up in the quarter. He subscribed to the view that *C. pyogenes* was an early secondary invader, and where cures were claimed, the *pyogenes* had not had a chance to establish itself. His own experience of "clinical" cures showed on culture to be *Strep. dysgalactiae*.

They had not heard about *Str. uberis*, the bacterium which caused him most trouble in his practice throughout the year. Nothing seemed to touch it, and he would like to hear what Mr. Wilson said about this. Another point related to staphylococcus mastitis in the newly calved cow. Results were encouraging from the use of intermammary aureomycin. Cures were obtained in about 80 per cent. of the cases, while penicillin gave no cures at all.

Mr. R. A. Paterson (Totnes) said that he congratulated Mr. Wilson, particularly for laying emphasis on the problem of prevention. He believed a large part of the answer to control rested in what one might call a re-education of the dairyman in milking technique. One was forced, in practice, to the conclusion that nowadays probably the vast majority of cases of clinical mastitis was initiated by some form of injury to the udder, and it was his belief that the answer, as Mr. Wilson indicated, related to the milking technique in most cases. Individual cows had injuries inflicted upon them by others, but the majority, where it was a herd problem, were injured by milking technique.

It was his experience that, in the main, herd problems were started by faulty liners, not individuals. It appeared that the management of the liners could be implicated in many cases. Too often they were used after their useful life had finished. They caused inflammation of the teat and, if the organism pre-existed, a clinical mastitis followed.

That accounted also for a large amount of atypical mastitis. The external injury initiated by this means, and aggravated by the use of many detergents and a certain amount of neglect, was a common habitat for *uberis* and other organisms.

Turning to summer mastitis, Mr. Paterson did not think it was always necessarily due to infection by *C. pyogenes*. When using *pyogenes* toxoid in herds with a heavy incidence he found there resulted a large number of inflamed quarters which, in heifers only, did not develop as typical *C. pyogenes* would be expected to. In most cases there was the usual initial straw-coloured secretion which did not, however, become purulent, and spontaneous recovery often ensued.

It would be interesting if Dr. Pearson would indicate if in his controlled experiments with *pyogenes* toxoid there was a distinct difference between the incidence of proved *pyogenes* infection in cows and that in heifers.

Would Mr. Wilson say something on the best method in practice of coming to some sort of diagnosis as to the type of infection? By the time one got a report, which was of merely historical interest, from the laboratory, the quarter was either lost or an apparent cure was obtained. Mr. Paterson had used the Van Rensberg method in a large number of cases. Unfortunately, in practice one did not have much time for that sort of thing, but in probably 80 per cent. of cases one could, by its use, come to some sort of approximate diagnosis as to the infecting organism and it seemed to be the method which gave the best results in practice Some comments by Mr. Wilson on that method would be welcome.

The real answer was not solely in fighting mastitis with antibiotics but in re-teaching the milking staffs with regard to their attitude to milking. One found that dairymen were always wandering about changing their employment and looking for better conditions, and the cows suffered in consequence. One felt they had lost a certain

amount of their conscientiousness in their job, which had its effect on the cows. If attention was paid to this aspect Mr. Paterson felt there would be a vast diminution in the amount of clinical mastitis.

Mr. H. M. Wilson (Cupar, Fife) thanked the author for his paper and, with regard to summer mastitis, agreed that the type of organism should be determined, because sometimes the outbreak might be that involving *pyogenes*, while in other cases it was a mixed infection. The suggestion that a different approach should be made to the subject of mastitis was an interesting one. He crossed swords with Dr. Edwards because he seemed to treat staphylococcus infection rather lightly.

Mr. D. R. Wood (Crediton) said he was wondering if one thing had been stressed quite enough. Were they thinking sufficiently about the health of the cow generally? He had come across many cases in which stubborn mastitis was cleared up by the cow being looked upon as an individual and getting the right diet. Taking two cows in particular, one had needed more potent treatment and the other less potent treatment before their mastitis cleared up completely. Were all these drugs being given a chance while the farmer tampered about with nature by using bags of phosphates—which were all right up to a point—instead of manures? If the farmer would get down to looking upon the cow as an individual there would be a better chance of satisfactory results through the use of penicillin and the other antibiotics.

The trouble in one case that Mr. Wood was dealing with at the present time was not due to the milking technique or the amount of food the animal was having but to the general nature of the food being given. Were the animals being given a chance to fight from the inside while veterinarians fought from the outside?

THE REPLY

Mr. Wilson, in reply, first thanked Mr. Dunn for so ably opening the discussion. On the question of milking technique it was amazing how little farmers knew of how machines worked. Recently in dealing with a very high-class pedigree herd he found the cowman did not know that the cow did not milk at the squeeze-phase of the pulsation. Much more attention should be paid by veterinary surgeons not only to milking technique but also to the efficiency of the milking machines and care of liners.

How was it that one man who took all the care in the world experienced mastitis, while another man who was careless and very dirty did not? That was just one of those things it was hard to explain. One might say that one man had susceptible cows and other resistant cows. It should not be forgotten, however, that what one farmer would say was mastitis another would say was a condition in which the animals were a bit drawn but not suffering from mastitis.

Mr. Dunn appeared to doubt if there was any selection of fast-milking cows. There might not be that selection, but there was a selection of high-yielding cows, and the two things went together.

It had been asked why they did not try out some of the old sulphonamides. When one tried out a new method one used the best possible treatment as a yardstick. When new antibiotics were used they were compared with the best current treatment, which was penicillin. As to the rôle of plant oestrogens Mr. Wilson pleaded ignorance. Regarding the parenteral administration of antibiotics, he had tried to suggest they should not just go along and push in some antibiotic. If it was believed that a disease emanated from another part of the body it was obviously good sense to use an antibiotic intramuscularly.

As to the use of iodine in mastitis, no one knew what iodine did. It was supposed to remove fibrous tissue, but it was more probably elbow grease that did that.

Mr. Downham seemed to have had quite remarkable success in treating summer mastitis. Summer mastitis was the name of a disease complex, and if a pure *Str. dysgalactiae* infection was being treated certainly one would expect a cure. But a veterinarian must accept the fact that when he was brought in the damage might be done and the lactation tissue would be gone.

It had been pointed out why possibly some cases responded and others did not. In examinations carried out at Weybridge very many cases were found which contained only *Str. dysgalactiae*. Such cases responded to treatment but where a true *C. pyogenes* infection was established the prognosis was always gloomy.

Dr. Pearson's remarks were somewhat hard to reconcile because he said he believed summer mastitis was actually a non-bacterial disease and yet he claimed good results from penicillin in prophylaxis. How was penicillin going to prevent a non-bacterial condition? His remarks concerning the weather were interesting because certainly Mr. Wilson had found the term summer mastitis was a misnomer. Cases occurred in December, and often in February and March. Referring to the animal which developed summer mastitis in a blind quarter, the teat could have become occluded by being sucked by another calf which at the same time could have implanted infection in the quarter. It had not been shown that *C. pyogenes* came any other way than via the teat-canal in cases of summer mastitis.

Mention was made of the increase in staphylococcal mastitis once *Str. agalactiae* was removed. Certainly in the herds Mr. Wilson had examined that had not been found; but what did seem important was that when one changed the method of milking from hand to machine, there was an increase in staphylococcal infection.

On the question of staphylococcal mastitis and reinfection, he agreed with those who thought that the staphylococcal problem was the major one; but who had the solution to it? How were they to attempt to eradicate a parasite which was found on the human hand, and in the nose and throat? Surely they had to make conditions in the cow so good that she herself could look after any slight infections picked up during milking.

Dr. Edwards had disagreed with some of the findings in the paper. As to the sensitivity of staphylococci to penicillin, Mr. Wilson was quite surprised to hear it said that all staphylococci were still sensitive to penicillin. That was completely against the findings of other workers. He thought they had to accept the idea that they were going to find these resistant staphylococci. It was not a question of penicillin producing resistance; it was a question of selection. As one treated the staphylococci one would knock out those which were sensitive and leave the resistant ones, and so get more and more staphylococci which were resistant to penicillin.

Aureomycin was more successful in treating cases of staphylococcal mastitis than was penicillin. It was underestimating the problem very seriously to say that all staphylococci apparently did was to produce a sub-acute mastitis after four or five days and if one treated that condition it got better although the staphylococci were still there.

Mr. Wilson said he knew of a herd in which staphylococcal infection was introduced this year. There had been no case of clinical mastitis and yet an average of 200 gallons a cow was lost. A relief milker was introduced and it was interesting to watch the graph rising; and as soon as the usual milker came back the output decreased again.

He had not much experience of treating gram-negative infections with penicillin. One would not expect penicillin to have any effect and he could not give any indication as to what would be the antibiotic of choice for these infections.

It had been asked if there would still be a problem if all the best known methods of treatment and hygiene and good milking technique were adopted. That was hard to answer, but Mr. Wilson thought he would stand by his original statement that mastitis would always be with them. Obviously good hygiene and milking technique was not going to affect the summer mastitis problem in any way, but summer mastitis was not their immediate problem. It was the staphylococcal problem that was so urgent and they had got to find the answer to it.

Str. uberis was sensitive to penicillin and there should be a response. If there was not, the antibiotic probably was not getting in contact with the organism. It was for

that reason that a penetrating agent with the antibiotic was suggested.

Mr. Wilson was pleased to hear it said that there was much more success with aureomycin than with penicillin in treating staphylococcal cases.

Mr. Paterson had underlined the importance of milking technique and the question of faulty liners. It was Mr. Paterson's view that it was not so much a question of the type of machine as of the care with which it was used. Mr Wilson recalled that he himself had made the statement that a good milkman could milk with a vacuum cleaner, and that was pretty well true. He had personal opinions as to which were the best machines, but the quality of the machines did not differ to the extent that whereas one caused mastitis another did not. It was true that teat sores might be a source of infection.

One or two members had referred to *C. pyogenes* toxoid. In answer to that he might reiterate that the futility of attempting any method of control using a *C. pyogenes* toxoid had been demonstrated. There were many who said it worked and they had 20 cows to prove it, but Weitz had 2,000 cows to disprove it.

As regards treatment of clinical cases, one must use a milk film. One should know what one was trying to treat, and by examination of a milk film one would have some kind of idea. It still might be of advantage to send a sample to the laboratory so that, in the event of treatment failing, the antibiotic of choice for the organism involved could be selected.

With regard to Mr. H. M. Wilson's remarks, he agreed that staphylococci presented the problem they would have to face in the coming years and it certainly could not just be disregarded. Mr. Wood referred to the cow's general condition. The paper said there were three things necessary for clinical mastitis, namely, a susceptible cow, a causative organism and the conditions for allowing that organism to affect the cow. It was part of the way in preventing any disease to see that the animal was properly fed, properly housed and properly looked after in general.

Mr. Wilson concluded by saying that he had endeavoured to make the paper controversial and, although it had fallen on stony ground in that some of the controversial points were not taken up, he wished to express his gratitude to them for listening to him so well.

The Chairman, in proposing a vote of thanks to the author, said it would be agreed by all that they had had a very instructive afternoon. Mr. Wilson had presented the paper and answered points raised on it in an excellent way.

The vote of thanks was carried with applause.

Current Literature

DIGEST

With this issue of "The Record" is begun a new feature intended particularly for the practising veterinary surgeon. The following succinct paragraphs survey selected articles printed in recent copies of the three American veterinary journals—"The Journal of the American Veterinary Medical Association"; "Veterinary Medicine"; and "The North American Veterinarian."

Journal of the American Veterinary Medical Association

An unidentified fungus, carried by straw, is suggested to be the cause of a weeping eczema of young pigs known as "greasy skin disease." The lesion commences on the skin of the neck and shoulders as an exudation of serum associated with a rancid odour. The only effective treatment is the removal of all straw from the sty, and washing the young pigs in soap and water.

Riser lists pneumonia and panleucopenia (feline enteritis), as the two most common infectious diseases of cats in America. Both these conditions are caused by a virus, but the pneumonia is not associated with the high mortality which is characteristic of panleucopenia. Riser recommends that the pneumonia should be treated with a subcutaneous injection of 5.0 mg. per kg. of aureomycin daily. Panleucopenia can be combated with serum, and antibiotic treatment, provided the case is presented in its early stages. As a prophylactic, cats should receive two or three doses of vaccine at five to seven months of age.

Concern expressed by a prominent (medical) physician at the vanishing art of diagnosing "with eyes and ears" provides the subject of the Editorial of the September number of the *Journal of the American Veterinary Medical Association*. The value of external and internal palpation, in addition to the use of eyes and ears is emphasised, and young veterinarians are warned not to rely upon laboratories to make their diagnosis for them.

Thirteen case histories in small animals, in which a new antibiotic, carbomycin (magnamycin) was used, are described by Antelyes. Carbomycin has been isolated from *Streptomyces halstedii*, and is stated to have a spectrum of activity similar to that of penicillin. The antibiotic was given by mouth, at dosage rate of 30-65 mg. per kg. bodyweight, every 24 hours, and apparently succeeded in overcoming symptoms of diarrhoea, coryza, and pneumonia which had failed to respond to other antibiotics. No toxic side effects were observed.

An intravenous injection of an unspecified solution of "calcium, phosphorus and magnesium" is claimed by Rydell to be effective in the reduction of the tenesmus which accompanies vaginal and rectal prolapse. A dose of 150 to 350 ml. of the solution is recommended for a cow. Rydell also observed that 500 ml. of calcium gluconate (concentration not given) to a cow was useful in reducing straining, although it was less effective than the mineral mixture.

The North American Veterinarian

Reference to subcutaneous injections in cats is made in a letter by Barry, who advises his colleagues to make the injection slowly, in the region of the last rib, raising the animal slightly as the needle is pushed through the skin.

Persistent vomiting in a dachshund was found to be attributed to an enlarged spleen, six times the normal size, which was pressing on the wall of the stomach. Removal of the spleen, which is described as a simple operation, was followed by an uneventful recovery.

Persistent vomiting was also the subject of a paper by Vine who found that this symptom, in two puppies, would not respond to treatment. In one puppy, laparotomy confirmed a diagnosis of pyloric stenosis, made from an X-ray examination. The

thickened serosa and muscularis of the pylorus, but not the mucosa, was therefore incised and left unsutured to allow the pyloric opening to dilate. This operation was successful and the puppy was eventually able to take normal food. The second puppy was found to be suffering from a diaphragmatic hernia, in which the stomach had passed into the thorax through the oesophageal ring of the diaphragm. This condition was also successfully corrected by operation.

Veterinary Medicine

A seed disinfectant containing mercury is incriminated as the cause of illness in seven cows, two of which died. Contamination of oats occurred when they were ground on an area which had been used previously for the application of the seed disinfectant. These oats were then fed at the evening feed. The next morning seven animals were found to be off their food, two showing signs of colic. The body extremities were cold, and the temperature was subnormal. Death occurred in two animals the same day as these symptoms were observed. A *post-mortem* examination revealed a haemorrhagic enteritis and a marked nephritis. The surviving animals were given an intravenous injection of 30 ml. of a 20 per cent. solution of sodium thiosulphate. (Herberg).

Gier returns to the controversial subject of the effect of chlorophyll on the mating odours of bitches. Evidence of 18 cases are quoted to support the writer's contention that an effective reduction in the attraction of bitches to dogs will result if the level of chlorophyll administration is maintained at 4 mg. per kg. bodyweight. A chlorophyll dosage below this amount is prone to give uncertain results because of the considerable individual variation in the intensity of the sex odour of the bitch, and the perception of the male. The chlorophyll preparation used is described as a "metal free chlorophyll derivative," and was added to the food.

Eight goslings sharing a water trough with a hive of bees imbibed some of their arthropod mess-mates with disastrous results. A *post-mortem* examination of the goslings revealed bee stings in the hard palate and pharynx associated with swellings and oedema of the glottis. It was deduced that death was caused by obstruction of the air passages. Cumro.

D. W. J.

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ABSTRACTS

Influence of Sodium Salts on the Closure of the Oesophageal Groove in Calves. RICK, R. F. (1954). *Aust. vet. J.* **30.** 29–37.

The activation of the oesophageal groove mechanism in calves by sodium and other salts was investigated with a view to improving the efficiency of anthelmintic treatment.

The authors show that glucose administered directly into the abomasum by puncturing the organ through the abdominal wall or by administration through an abomasal cannula produced a rise in blood sugar in most calves 6 to 11 months old. The greatest values were formed one hour after administration. Introduction of glucose into the rumen in a similar manner did not produce a rise in blood sugar.

In most calves of this age glucose given as a drench caused no increase of blood sugar, *i.e.*, the glucose enters the rumen, but in 20 to 30 per cent. a significant rise indicates that activation of the oesophageal groove mechanism has directed some of the solution into the abomasum.

Drenching with a glucose solution 15 seconds after drenching with solutions of test drugs gave a significantly increased number of direct abomasal passages with 10 per cent. $NaHCO_3$ and to a less extent with 10 per cent. NaCl. Thus 60 ml. of 10 per cent. sodium bicarbonate produced 93 per cent. of direct passages, while 10 per cent. sodium chloride solution was less effective producing approximately 80 per cent. of direct passages. Other drug solutions tested, including 60 ml. of 5 per cent. copper sulphate solution which excites the oesophageal groove reflex in sheep, had little effect.

The results were confirmed using a solution of glucose containing dye as the test drench and making a *post-mortem* examination after one hour to determine the distribution of dye within the stomach. The two methods gave almost identical results.

A. M. L.

A Simple Diagnostic Test for Pancreatic Enzyme Deficiency in Dogs. JASPER, D. E. (1954). *N. Amer. vet.* **35.** 523–525.

With the object of simplifying the diagnosis of pancreatic enzyme deficiency, the author has modified the proteolytic test for application to canine faeces. Preliminary experiments showed that faeces diluted in water had an acid *p*H, sometimes as low as 4·5, and although trypsin is active over a wide range of *p*H, it works best at *p*H 8·0. Accordingly, the tests were made in an alkaline medium and this was found to reduce the number of false negatives in the film test.

Of the two methods used for detecting trypsin, the tube test was found to be the more reliable. The technique is as follows.

One ml. of 1 : 10 dilution of faeces in water and 1 ml. of 5 per cent. sodium bicarbonate are mixed with 2 ml. of 7·5 per cent. gelatin warmed to 37·5° C. The mixture is incubated at 37·5: C. for one hour or left at room temperature for two and a half hours, and then refrigerated for 20 minutes. Failure to gel indicates the presence of trypsin.

For the film test, a 1 : 10 dilution of faeces in 5 per cent. sodium bicarbonate solution is used. A large drop of this is placed on X-ray film (undeveloped film or the dark portion of developed film), and after allowing time for reaction as in the tube test, the drop is washed off gently. Solution of the gelatin film indicated tryptic activity.

In a series of 100 examinations of supposedly normal canine faeces, only one tube test indicated lack of trypsin (negative reaction), but on subsequent days samples from this animal gave positive results. Six tests on a dog with atrophy of the pancreas gave consistently negative results.

The film test is subject to error in various ways. For example, if the drop dries on the film, the test is not reliable. Hard faeces may not give a positive result, even in the tube test, possibly because of a progressive decrease in tryptic activity during retention of faeces. However, constipation is unlikely in cases of pancreatic enzyme deficiency, which are usually characterised by soft loose faeces.

Consistently positive results in either test rule out the possibility of pancreatic enzyme deficiency. Consistently negative results strongly suggest pancreatic enzyme deficiency.

I. W. J.

News and Comment

FIELD STATION FOR GLASGOW UNIVERSITY VETERINARY SCHOOL

The University of Glasgow has recently purchased the estate of Cochno which is situated a few miles north-west of Glasgow in the county of Dunbarton and is within easy reach of the Veterinary Hospital which has been established at Garscube. The whole estate comprises 200 acres of pastures and arable land, about 50 acres of woodlands, and a mansion.

The University's objective is to develop Cochno as a field station for the Veterinary School, and it will be used both for teaching and research.

Already the home farm, with its dairy herd and pig unit is being made use of by the Veterinary School, and the mansion will ultimately be used as a hostel for fourth year students during their period of practical training in animal husbandry and preventive medicine.

Conversion from a commercial farm to a field station will be a gradual process and it will be some years before it is in full use.

THE ESSEX VETERINARY SOCIETY

The Essex Veterinary Society are pleased to announce that the Council B.V.A. have now given recognition to the Society as a Division of the B.V.A., with two representatives on the Council. It is hoped that all members of the profession in the County of Essex who are not already members of the Society, but who wish to join, will contact the honorary secretary, Mr. Roger Massey, 11, Widford Road, Chelmsford.

The next meeting of the Society, at the Essex Institute of Agriculture, will be held on February 24th, 1955, when Mr. William C. Miller will be the speaker.

COMING EVENTS

Dec. 8th.—Ordinary General Meeting of the Sussex Division, B.V.A., at the Old Ship Hotel, Brighton, 2.30 p.m.

Dec. 8th.—Meeting of the Technical Development Committee, at 7, Mansfield Street, Portland Place, W.1., 10.30 a.m.

Dec. 9th.—General Meeting of the East Midlands Division, B.V.A., at the School of Agriculture, Sutton Bonington, 2.15 p.m.

Dec 9th.—Meeting of the Editorial Committee, B.V.A., at 7, Mansfield Street, Portland Place, London, W.1, 2 p.m.

Dec. 10th.—Ordinary General Meeting of the South Wales Division, B.V.A., at the Park Hotel, Cardiff, 11.30 a.m.

Dec. 15th.—Meeting of the Section of Comparative Medicine, the Royal Society of Medicine, at 1, Wimpole Street, London, W. 1, 5 p.m.

Dec. 16th.—Ordinary General Meeting of the South Eastern Division, B.V.A., at the Royal Star Hotel, Maidstone, 2.30 p.m.

Dec. 23rd.—General Meeting of the Southern Counties Division, B.V.A., at the Grand Hotel, Bournemouth, 6 p.m.

Dec. 30th.—Annual Dance of the Ladies' Guild, Dumfries and Galloway Branch of the V.V.B.F., in the Cairndale Hotel, Dumfries.

Jan. 27th.—Annual Dinner-Dance of the North of Scotland Division, B.V.A. (in aid of the Victoria Veterinary Benevolent Fund), in the Northern Hotel, Aberdeen, 7.30 p.m.

PERSONAL

Births

HALL.—On November 23rd, 1954, at 12, South Street, Dorchester, to Jenefer (*née* Monro) and Sherwin A. Hall, M.R.C.V.S., a sister for Timothy—Melanie Elizabeth.

RODDIS.—On November 20th, 1954, at Hemingford Grey, Huntingdon, to Jeanne, wife of A. F. Roddis, B.SC., M.R.C.V.S., a son—brother for Jennifer.

R.C.V.S. OBITUARY

FOREMAN.—Richard Joseph, of 2, South Side, Tottenham Green East, Tottenham, N.15. Graduated Edinburgh, May 27th, 1892; died November 13th, 1954, aged 87 years.

REDDIN.—Thomas Kerry, of 45, Fitzwilliam Square, Dublin. Graduated Dublin, July 17th, 1913. Died February 12th, 1954.

SINGH.—Balbur, Superintendent, Civil Veterinary Department, Ambala, Punjab, India. Graduated London, July 14th, 1954; died June 20th, 1954, aged 48 years.

MR. RICHARD FOREMAN, M.R.C.V.S.

A correspondent writes:—

Mr. Foreman had retired from active practice, but still kept in close touch with his professional colleagues. He was 87 years of age, and began practice in the Tottenham district long before the coming of motor traffic. Among the older residents of the neighbourhood his name was widely known and greatly respected.

MAJOR FRANK BAKER GRESHAM, M.C., T.D., M.R.C.V.S.

A correspondent writes:—

Major Gresham died at the home of his daughter, Mrs. R. M. Loveday, 209, London Road, Balderton, Newark, Notts.

After qualifying in 1895 he assisted his father in his veterinary practice until the outbreak of the Boer War, when he was commissioned and was sent to New Orleans to purchase horses for the Government. From there he was drafted to South Africa with horses for the British Forces. He was attached to the 2nd Mounted Infantry.

In 1914 he was with the B.E.F. in the Veterinary Corps and was awarded the M.C. for his services in the retreat from Mons. He served in Egypt and Palestine where he was in command of the 31st Veterinary Hospital.

Between the wars he practised in Newark and was, until the end of last year, veterinary surgeon to the Southwell race course. He was a keen sportsman and a well-known figure on the course at Rolleston.

MR. L. J. FORD

Mr. G. N. Gould writes:—

L. J. Ford—Joe or "Florrie" Ford—was a popular figure in Hampshire in the profession, in agriculture, and in club life. He achieved success both as a veterinary surgeon and as a farmer. In public life he was a representative of the District Council, to whose affairs he brought that enquiring mind, acute observation, and assessment of matters in hand that marked his career in other fields.

His success in the profession—as Divisional Veterinary Officer in Hampshire and later for a short period in general practice—was accompanied by a popularity with his colleagues associated with his ability, his sense of humour and his good fellowship.

In farming I watched him convert an almost derelict, heavy clay farm with a non-designated herd, to an efficient, highly productive, well-farmed unit. He learned quickly as he went along, sought advice from those who could provide it, and having made his decision applied it with vigour.

It was but a few days before his untimely end that he phoned telling me of his doctor's advice, making, as it now seems certain, light of his affliction, and telling me that he would decide about the farm when he came home.

Joe Ford was a good club man—mid-handicap golfer, left-handed and difficult to beat—a good snooker and billiards player—a member of the Southampton Yacht club and of Stoneham Golf Club.

He married a charming American wife, Barbara, whose interest in the farm was unbounded. They have an only son who has already made up his mind to farm, to whom the deepest sympathy of their many friends will be extended.

NORTH OF IRELAND ASSOCIATION DANCE IN BELFAST

The North of Ireland Branch of the B.V.A. held its annual dance at the Grand Central Hotel, Belfast, on November 12th. There was a record attendance of 320, and a most enjoyable evening was spent. The President, Dr. T. G. McNabb and his wife, Mrs. McNabb, M.P., received the guests.

A small ballot held in aid of the Victoria Veterinary Benevolent Fund was generously supported.

[Photo by courtesy of *The Belfast Telegraph*.

Our picture shows, left to right: Mrs. Pearson; Dr. McNabb (President); Mrs. McNabb, M.P.; Dr. Pearson (Hon. Secretary); Mrs. Gordon (wife of the Assistant Hon. Secretary); Professor Lamont (President-Elect); Mrs. Luke and Dr. Luke (Treasurer).

ACCESSIONS TO THE R.C.V.S. LIBRARY

The following publications have been received in the library during the last week.

CHAPMAN-HUSTON, D. *and* CRIPPS, E. C. Through a city archway; the story of Allen and Hanburys, 1715-1954. London, Murray, 1954.

GREAT BRITAIN. Laboratory Animal Bureau. Collected papers, 1954. Vol. 2. The design of animal houses. London, L.A.B., 1954.

MILLAR, R. *and* TUCKER, R. Suspected lymphosarcoma in the intestine of the koala bear (*phascolarctos cinereus*) (Pamphlet).

NICKEL, R. *and others*. Lehrbuch der Anatomie der Haustiere, Band. 1. Berlin, Paul Parey, 1954.

RESTRICTIONS ON THE MOVEMENT OF POULTRY IN MID-NORFOLK

During the last few weeks about forty outbreaks of fowl pest have been confirmed on premises in the central parts of Norfolk. The Minister of Agriculture and Fisheries has accordingly made an Order entitled The Live Poultry (Mid-Norfolk) Order, 1954. The main effect of this Order is to prohibit as from November 29th, 1954, the movement of live poultry into, out of and within that part of mid-Norfolk specified at the end of this note.

The Minister will be prepared, after the lapse of a suitable period and in the light of the trend of fowl pest in the scheduled area, to consider exceptionally the issue of licences under his general powers authorising the movement out of the area of breeding stock of poultry from the premises of accredited poultry breeders and perhaps of other breeders. An announcement as to the time and form of such applications will be made later. In addition, the issue forthwith in exceptional circumstances of licences for essential movement (*e.g.* for the purpose of restocking) of store poultry may be permitted at the Minister's discretion. Applications should be addressed to the Divisional Veterinary Office, 106, Thorpe Road, Norwich.

The scheduled area is as follows: In the county of Norfolk, the Petty Sessional Divisions of Eynsford, Midford and Launditch. In the Petty Sessional Division of Forehoe, the parish of Runhall.

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax:

Ayr. Oldmains Farm, Kilwinning (Nov. 23).

Ches. Tiverton Hall, Tarporley (Nov. 22).

Denbighs. Lower Farm, Isycoed, Wrexham (Nov. 22).

Flints. Cil Green Farm, Iscoyd, Whitchurch (Nov. 23).

Gloucs. Winchcombe Farm, Chipping Sodbury, Bristol (Nov. 25).

Leics. Dairy Farm, The Ferns, Bottesford (Nov. 23); Tamborough Farm, Gaulby, Billesdon (Nov. 24).

Westmorland. Lane End, Levens, Kendal (Nov. 22).

Wilts. Cottles Farm, Atworth, Melksham (Nov. 24).

Fowl Pest:

Devon. Mole Barrow, Holdstone, Combe Martin; Stockland Cottage, Heddon Mill, Braunton (Nov. 23).

Essex. Church Barn, Church Street, Witham (Nov. 24); Nr. the School, Colne Engaine, Colchester (Nov. 25).

Lincs. Hill Top Farm, Wells Road, Healing, Grimsby (Nov. 21); 56, Eastwood Road, Fishtoft, Boston (Nov. 22); 23, Eastwood Road, Fishtoft (Nov. 23); Heapham Mill and New House Farm, Heapham, Gainsborough; 138, Eastwood Road, Fishtoft (Nov. 25).

Norfolk. Bearton House, Welborne; Quaker House and Kensington House, Mattishall, E. Dereham (Nov. 25).

Sussex. White House Farm, Waldron, Heathfield (Nov. 25).

Swine Fever:

Ches. Top Road, Kingsley, Warrington (Nov. 29).

Essex. Bush Farm, Corbets Tey, Upminster (Nov. 24).

Flints. Greenfields, Northrop Road, Flint (Nov. 26); Cae Llyn, Cymau, Wrexham (Nov. 29).

Gloucs. Church Farm, West Littleton, Marshfield, Chippenham (Nov. 24).

Hants. Yeomans Road, Throop, Bournemouth (Nov. 29).

Hereford. The Broad Farm, Leominster (Nov. 25); Portway, Orleton, Ludlow (Nov. 29).

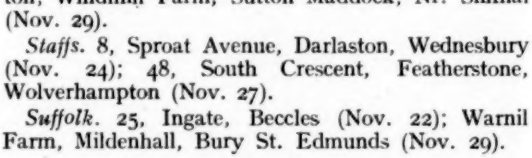
Lancs. Holly Farm, Long Lane, Thornton, Liverpool, 23 (Nov. 23); Rose Grove, Chipping, Preston (Nov. 24); Catterall Hall, Catterall, Garstang (Nov. 29).

Lincs. Scabcroft Farm, Horkstow, Barton-on-Humber (Nov. 26).

Salop. 2, Horseshoe Lane, Eastwick, Ellesmere (Nov. 22); Hen Barns, Trefonen, Oswestry (Nov. 25); Churchmoor Farm, Marshbrook, Church Stretton (Nov. 26); White House Farm, Roden, Wellington; Windmill Farm, Sutton Maddock, Nr. Shifnal (Nov. 29).

Staffs. 8, Sproat Avenue, Darlaston, Wednesbury (Nov. 24); 48, South Crescent, Featherstone, Wolverhampton (Nov. 27).

Suffolk. 25, Ingate, Beccles (Nov. 22); Warnil Farm, Mildenhall, Bury St. Edmunds (Nov. 29).



A group of the guests at the annual dinner-dance of the South Wales Division, held on October 22nd.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

IMMUNISATION AGAINST SUMMER MASTITIS

Sir,—May I through your columns enquire from members their experience with the use of *C. pyogenes* toxoid on a herd basis, as a prophylactic against summer mastitis?

Following the extensive outbreak this year, enquiries have been received from farmers who wish to know whether their cows and heifers can be effectively immunised against the condition. If there are practices where such immunisation is carried out as a routine, it would be of interest to know the comparative incidence of summer mastitis in the vaccinated and non-vaccinated herds during the past " summer " in order to assess the efficacy of the toxoid as immunising agent.

Yours faithfully,

H. A. CRAWSHAW,

37, St. John's Road,
Newbury.

November 25th, 1954.

ELECTROCUTION OF DOGS

Sir,—May I be allowed to express the gratitude which is felt by UFAW for the recent action of the British Veterinary Association in connection with electrocution, and for the work done by Dr. Roberts in that connection? This work is invaluable for two reasons. In the first place, without it the users of the condemned apparatus would never have been persuaded to discontinue its use. Dr. Roberts has confirmed, by direct observation of electro-encephalograms, the conclusions which were reached two years ago by Dr. Croft and myself by indirect inference from other facts. The evidence which we then presented appears to us conclusive, but it entirely failed to convince the societies concerned: this is proved by the fact that they continued to use the condemned cabinets during the period in which Dr. Roberts was carrying out his research. In the second place, Dr. Roberts has made a new and important discovery: this relates to the puzzling fact that when taken out of the cabinet, even after less than 12 seconds, the dogs were inert and relaxed. The explanation which I had suggested provisionally was that they might have swooned from pain shock, but Dr. Roberts has now proved that in fact consciousness continues although there is no movement; the relaxation must be due to extreme fatigue of the muscles. The importance of this discovery is illustrated by a recent statement from which it appears that one society which kills unwanted dogs is continuing to use the condemned technique under the impression that the inert condition of the animals proves unconsciousness—an impression which is refuted by Dr. Roberts's findings.

Equally must we thank the B.V.A. for laying down the conditions which are requisite for humane electrocution.

Without the authority of the B.V.A. we should never have succeeded in overcoming the resolute opposition to any technical investigation which we have so long encountered. By engaging Dr. Roberts, with the result that the facts have been established beyond all possibility of controversy, the B.V.A. has put an end to a most regrettable state of affairs and has earned our profound gratitude.

Yours faithfully,

C. W. HUME,

The Universities Federation for Animal Welfare,
7a, Lamb's Conduit Passage,
London, W.C.1.

November 26th, 1954.

A LEGITIMATE GRIEVANCE

Sir,—I very much deplore the suggestion, in recent letters to you, that better service to clients and better treatment of their animals is available at a charitable clinic than that provided by a veterinary surgeon in private practice.

The well equipped animal hospital, staffed by qualified persons, and open 24 hours a day is a rarity.

All " clinics " which I have known, including those with a qualified person in charge, have offered little more than " first aid " plus, of course, good advice. For financial reasons the cost of drugs is kept low, often by use of homeopathic treatment. The use of antibiotics, sera, and vaccine is minimal. The owner has to queue up with his animal at the appointed time, often in close contact with infectious cases, and out of hours treatment is usually not available.

The private practitioner will give treatment at any hour, and will attend cases in their homes, a very important point, as it is often fatal, both for the patient itself and for many of the other patients as well, for cases of canine distemper, and feline influenza, to attend a clinic or surgery.

Many small-animal owners are incredibly incompetent in the simplest duties of nursing and the administration of medicines; in such cases the conscientious veterinary surgeon calls and sees that the necessary treatment is carried out. When for reasons of business owners so often cannot attend during surgery hours the veterinary surgeon either calls at the client's home, or makes appointments out of hours for consultation at the client's convenience.

All this surely adds up to a better service than that offered by any " clinic."

In the matter of free treatment for animals belonging to poor people, frankly there are no *really* poverty stricken persons nowadays, and furthermore if there are such people they should *not* keep pet animals; the possession of a dog or cat, purely as a pet in an urban district is a luxury, ranking with the television set, the indulgence in tobacco, and visiting the cinema.

If one cannot afford to keep a pet, that is to pay for care and maintenance, plus occasional veterinary assistance, one has no moral right to make oneself responsible for the well-being of a living animal.

Should unexpected extra cost become necessary surely any owner who really cares for his pet would be willing to cut down on personal indulgences in order to foot the bill and it should be well known that it is a long standing tradition in the profession that in cases of genuine hardship, treatment is given free or at greatly reduced fees.

The prevalence of free clinics, in my opinion, merely encourages people to keep pets for which they are unable, or, more often, unwilling, to accept the responsibility of proper care.

Yours faithfully,

LUCY R. ROBINSON,

The Grey House,
Purleigh,
Chelmsford, Essex.

November 19th, 1954.

Sir,—The main complaints which the profession has against certain animal welfare societies are, I think, advertising and failure to observe the regulation that their services are only for those who cannot afford the fees of a veterinary surgeon. Not only do they get wide-spread publicity through their vans and through local money-raising activities, but also, in many cases, through the sentimental articles in the Press. When one animal welfare hospital was opened recently, the occasion was heralded by a whole page of photographs of the building and veterinary employees in the local newspaper. (Perhaps the veterinary profession should consider the advisability of having a Public Relations Committee of its own). Also, one frequently sees reports with photographs in the Press, in which animals are described as being treated by a " vet " or "veterinary surgeon," and I have yet to meet one lay person who is aware that, in many localities, when animals are taken to these clinics, it is only rarely that they are treated by a qualified veterinary surgeon.

The second point is the treatment of animals of those people who can well afford to pay a fee. I think that a genuine attempt is made by some employees of animal welfare societies to observe the letter and spirit of the regulations in this respect, but it is obvious that many more make no effort to do so. The attitude of the latter can be summed up by the reply to a colleague of mine who tackled one about a particularly flagrant breach of these regulations—" The fact that Mr. ——— owns his own house, television set and a £1,000 car, and that his wife has a fur coat, does not mean that he can afford to pay the fees of a veterinary surgeon." I feel sure that other veterinary surgeons know of many similar instances where well-to-do people have had, and are still receiving, free treatment from these Societies.

Dr. Tom Hare has given us the answer to the whole question in his recent letter. The R.C.V.S. may have no jurisdiction over the Societies themselves, but it certainly has over a large proportion of their employees, and it should, where necessary, exercise it.

Yours faithfully,

J. RHODES,

Lyndum House,
High Street,
Petersfield, Hants.

December 1st, 1954.

POSTAL ADVERTISEMENT

Sir,—Attempts are being made by some manufacturers of veterinary medicines to smother the practising veterinary surgeon—to smother him under a shower of highly coloured postal advertisements. Almost daily we receive a natty little aide-memoire to the dosage of " canicide " or a glossy pamphlet printed in several colours extolling the virtues of the products of the ——— laboratories, with photogravure illustrations of cattle and sheep (for the illiterate, one presumes); or sometimes diagrams showing the influence of the concentration of the drug on the balance sheet of the veterinarian.

May I appeal, sir, for an end to this childish art-competition? The resulting economy could be used to reduce prices.

Yours faithfully,

F. B. HALPIN,

6, Passey Place,
Eltham, S.E.9.

November 26th, 1954.

WILLIAM HUNTING

Sir,—The cover of THE RECORD is a considerable improvement and should be continued in its present form, without the portrait of William Hunting.

Yours faithfully,

COLIN J. BEESLEY,

187, Broad Lane,
Coventry.

November 25th, 1954.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th November, 1954		23	—	—	29	—	49
Corresponding period in	1953	17	—	5	35	—	73
	1952	119	—	1	7	—	21
	1951	15	—	5	62	1	74
1st January to 15th November, 1954		280	4	12	659	—	1,294
Corresponding period in	1953	545	—	34	825	—	2,509
	1952	961	—	495	206	1	764
	1951	354	—	33	715	6	1,196